4.—THE OLIGOCHAETA OF SOUTH-WESTERN AUSTRALIA.*

BY ADA JACKSON, M.Sc.

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* A contribution from the Department of Biology in the University of Western Australia.

An account of the oligochaetes of South-Western Australia was published by Professor W. Michaelsen, of Hamburg, in 1907, the work being the result of a six-months tour made in company with Dr. R. Hartmeyer. He found the country rich in earthworms the vast majority of which belonged to new and endemic species. This was only to be expected in a region such as this, where the rainfall is good and where desert country makes migration to or from the eastern states almost impossible, but it is curious to note that almost every locality is characterised by its own species which for some reason are restricted to that district. The result is that an extraordinarily large number of species are represented ; Michaelsen recorded fifty-two, and another twelve species and one variety must now be added to the list. The discovery of these twelve new species is not the result of an organised search, but specimens have been collected together with other creatures during occasional excursions during the past two years. Of the fifty-two species mentioned by Michaelsen only nine have since been found, though it must be admitted that very few of the same localities have been explored.

Michaelsen states that he found *Helodrilus caliginosus* Sav. and *Microscolex dubius* (Fletcher), both forms which have been introduced by man, at almost every station where he collected. The preponderance of these two species has also been shown, so far as *H. caliginosus* is concerned in recent collections, but *M. dubius* does not appear to be quite so common in the districts where this collecting was done, that is, in the neighbourhood of Perth and in the unfarmed districts round Nornalup. It has however been found in three places, on the island of Rottnest, near the sea coast at Cottesloe, and inland at Wongong.

Of the other introduced forms, *Pheretima heterochaeta* Michlsn. and *Eisenia foetida* Sav., have again been found. *Eisenia foetida* was recorded by Michaelsen from Albany, and concerning it he stated that as yet it had not spread from the locality where it was first introduced. Recently specimens have been taken at Monger's Lake and Kalgoorlie. It is scarcely possible that in a few short years they could have reach these two places by natural means, and improbable that loads of soil would be taken from Albany to the far more fertile districts round Kalgoorlie, but it may be that the worms have been transported in small quantities of soil, possibly with pot-plants.

A new species of the genus *Eiseniella* is also described in the following pages. Though hitherto unknown it is doubtful whether this species is endemic, for the Lumbricidae are for the most part northern-hemisphere forms, and no genera or species are known to be native to Western Australia. It is however possible that under the conditions of a new habitat it may have developed from the introduced *Eiseniella tetraedra* Sav.

With one exception all of the new species here described are megadriles. No attempt has been made to extend the knowledge of West Australian microdriles, though, contrary to the accepted idea, these small worms are very abundant. *Dero* and *Nais* in particular are quite common and when worked out will probably be found to represent a number of species.

Concerning the indigenous megadriles Michaelsen comments on the small size of the individuals. Recent collections have also gone to show that the vast majority are decidedly small, but *Megascolex swarbricki* Nicholls and Jackson and *Megascolex syndetoporus*, sp. nov., both attain a moderate size, while one specimen of *Megascolex imparicystis* Michlsn. when extended measured 450 mms.

The sub-family Ocnerodrilinae is recorded from Western Australia for the first time, in the genus *Kerria* Beddard. Specimens of a species of this genus were found in a market garden on the banks of the Swan River, and since the river was unusually high at the time it seemed probable that they had been washed down by the flood waters from some locality further up the river. A short time after, however, large numbers were again taken. In view of the distribution of the genus, which is chiefly confined to the north of South America, it seems more probable that the present species has been introduced and has perhaps varied a little under the new conditions. If this is not so it is rather difficult to account for its occurrence.

Wegener's hypothesis of continental drift has recently been the cause of much discussion, and naturally it has been of interest to observe whether or not the earthworms of South-Western Australia lend any support to the theory. The Phreodrilidae, for example, occur in Australia, South Africa and South America, though not in India or Ceylon. This family offers the strongest support to the theory. Its members are found in localities that are far from human settlements and do not lie along the migratory tracks of any birds, so that its distribution cannot be accounted for by artificial means. The genus *Eodrilus* Michlsn., which has been separated from the older genus *Microscolex* (*Notiodrilus*), and from which most of Australia's oligochaete fauna has apparently developed, is restricted to the three southern continents and the intervening islands, but if it entered Australia by a southern route it is curious that no members of the genus have been found either in Tasmania, Victoria, or New South Wales. It is of course possible that further search may reveal them, or it may be that in those regions the genus died out during the glacial age, but at present it cannot be proved either that it entered from the south or from the north.

As regards distribution within the State, Michaelsen's reports are far the most part confirmed. He found that each genus was apparently restricted to a limited area, due presumably to the pressure of neighbouring forms which prevents rapid spreading. Species found since then have, with two exceptions, been true to these generic districts. The exceptions are *Megascolex* and *Plutellus*. A number of species of *Megascolex* were found in the extreme South-West, that is, in the districts where they were to have been expected, but two, *M. longicystis* and *M. imparicystis*, were collected near Perth. Only two specimens of the latter species had been found before and in both cases the locality label had been lost. Possibly they came from the environs of Perth, but in any case it seems that the *Megascolex* region extends as far north as Perth. Concerning *Plutellus*, a species was found at Yalgoo, that is, no further north but much further inland than any recorded previously.

In the following account the family and generic diagnoses and the descriptions of species previously recorded have been based upon those in Michaelsen's two works on Oligochaeta : " *Die Fauna Sudwest Australiens* " Band 1, Lief 2, and " Das Tierreich " Lief 10. New species are described in greater detail and specific keys have been compiled, but these include only species found in Western Australia. For the synonomy the reader is referred to the above-mentioned works. As regards terminology, that of Michaelsen is used for the most part, though the term " *spermiducal gland* " is prefered to " prostate," " Puberstatsorgane " translated as "accessory gland," and only definite outgrowths of the oesophagus referred to as " calciferous glands."

KEY TO THE FAMILIES OF OLIGOCHAETA.

1.	Asexual reproduction prevails, a budding-zone giving rise to chains of animals—2.	
	Asexual reproduction does not normally occur—3.	
2.	The brain connected with the hypodermis ; septa generally lacking (septum 1/2 rarely developed)	1. FAM. AELOSOMATIDAE.
	Brain free in the body cavity ; septa occur	2. FAM. NAIDIDAE.
3.	Spermathecal pores in furrow 4/5 rarely in 3/4 and 4/5 ; oesophagus without a gizzard	6. FAM. ENCHYTRAEIDAE.
	Spermathecal pores sometimes lacking, rarely in furrow 4/5 (in this case the oesophagus has a gizzard) usually more posterior—4.	
4.	1 pair of ovaries, usually in seg. 13, rarely further forward (in which case the mid-gut has 2 or more gizzards), or 2 pairs in segs. 12 and 13—7.	
	Ovaries in seg. 11 or 12 or further forward ; mid-gut without a gizzard—5.	
5.	1 pair of seminal funnels in the segment which bears the male pores, and usually a second pair in the proceeding segment	5. FAM. LUMBRICULIDAE.
	1 pair of seminal funnels in the segment proceeding that which bears the male pores—6.	
6.	Spermathecae anterior to the genital organs	3. FAM. TUBIFICIDAE.
	Spermathecae posterior to the genital organs	4. FAM. PHREODRILIDAE.
7.	2 or more gizzards at the beginning of the mid-gut ; male pores in furrow 12/13 or still further forward ...	9. FAM. MONILIGASTRIDAE.
	Usually only 1 or no gizzard at the beginning of the mid-gut ; should there be more the male pores lie in seg. 18 or in furrow 17/18—8.	
8.	2 pairs of male pores	8. FAM. HAPLOTAXIDAE.
	1 pair of male pores—9.	
9.	Male pores in seg. 13, no gizzard at the beginning of the mid-gut	7. FAM. ALLUROIDIDAE.
	Male pores usually more or less posterior to seg. 13 ; if they occur in seg. 13 a gizzard is present at the beginning of the mid-gut—10.	
10.	A well-developed gizzard at the beginning of the mid-gut	12. FAM. LUMBRICIDAE.
	No well-developed gizzard at the beginning of the mid-gut (rarely a rudimentary gizzard)—11.	
11.	Spermiducal glands usually occur (lacking only in forms which have a single pair of oesophageal pouches and a single pair of spermathecae in seg. 9, or are beset with numerous setae per seg., which condition does not happen in the Glossoscolecidae	10. FAM. MEGASCOLECIDAE.
	Spermiducal glands usually lacking (occurring only in forms in which the clitellum begins behind the male pore ; or the spermathecae are numerous on each side and open in groups along the furrow, without the setae becoming numerous in each segment, which condition does not happen in the Megascolecidae ...	11. FAM. GLOSSOSCOLECIDAE.

2.—Family NAIDIDAE.

Genus PRISTINA Ehrbg.

Prostomium usually drawn out in a tentacular fashion. Setae of the ventral bundle sigmoid, with a forked tip ; those of the dorsal bundle hair-like and beginning on segment 2. Genital organs of one species 2 segments behind the normal position in the Naididae, *i.e.*, testes in segment 7, ovaries in segment 8, spermathecae in segment 7.

In fresh water. Europe, North and South America, East Africa, India, Australia, Java.

Pristina longiseta, Ehrbg.

Prostomium elongated and either conical or thread-like, without eyes ; ventral setae of equal length ; dorsal setae in bundles of 2 or 3, those of the 3rd and following segments enormously lengthened, reaching in the case of segment 3 to the tip of the prostomium ; brain moderately deeply indented both anteriorly and posteriorly, the indentations forming a fairly sharp angle in each case ; stomach in segment 8 ; simple transverse commisural vessels in segments 3–8, those in 8 being swollen and heart-like.

Locality : Brunswick, in a brook.

Distribution : North America (Illinois, Pennsylvania), South America, (Paraguay, Chile, North Argentine) Europe (England, Belgium, Denmark, Germany, Bohemia, Switzerland), Africa (German East-Africa), India (Punjab, Gwalior, Travancore).

Genus DERO Oken.

Prostomium rounded, without eyes. Setae in 4 bundles per segment : ventral setae sigmoid with a forked tip, those in segments 2–5 longer than the rest ; dorsal bundles begin usually in segment 6, rarely in 5, and contain 1 hair seta and 1 or 2 needle setae with differently formed distal tips ; hinder end widens to a cup-shaped branchial area within which are paired branchiae ; gut with a gizzard-like dilatation ; dorsal vessel, communicating with the ventral vessel through several transverse vessels, usually simple ; the blood is red. Nephridia paired and with glistening funnels, occurring from egment 6 on. Testes in segment 5, ovaries in segment 6, spermathecae in segment 5.

In fresh water. Europe, North America, Antilles, tropical East Africa, Tonkin, Philippines, West Australia, India (Lahore).

Dero roseola, Nicholls.

1921 Dero roseola Nicholls. Journ. Roy. Soc. W.A., VII., p. 90, pl. 14.

Segments, 75. Branchial area funnel-shaped, bearing a pair of mobile cylindrical palpi and 3 pairs of ciliated branchiae, cylindrical in shape and almost of equal length but slightly shorter than the palpi. The first pair of dorsal setae bundles occurs in segment 5. The first pair of ventral setae bundles, in segment 2, consists of but 3 setae apiece. Succeeding ventral bundles have each four setae. The worm is of a delicate pink colour, reaches a length of 12mm., and is rarely found inhabiting a tube, but may be found collected into dense clusters forming a distinct pink mass.

Locality : South Perth, in a trough supplied by mineral water from a deep bore.

3.—Family TUBIFICIDAE.

Genus CLITELLIO Sav.

Setae of both dorsal and ventral bundles of the forked sigmoid type. Male pores in segment 11, spermathecal pores in segment 10. A supraintestinal vessel occurs but there is no integumental plexus. Atrium simple, prostate lacking. Penis without a chitinous sheath. Spermatophores occur in the spermathecae. Found at high-tide level on the coast of Europe and Western Australia.

Clitellio abjornseni, Michlsn.

Setae sigmoid and forked, with a nodulus. 3–4 setae in each dorsal bundle, 4–5 in each ventral, though the number is smaller in both cases in the last seta-bearing segment and the ventral bundles in segment 11 are lacking. The clitellum covers segments 11 and 12. Spermathecal pores in furrow 9/10. Seminal funnels cup-shaped each leading to a short neck-like vas deferens. Atria thick, ampulla-shaped, and bent, narrowing to open directly by the male pore. Spermathecae slender, pyriform, and bent, each leading to a short, narrow, non-glandular duct opening at the apex of a flattened papilla.

Length 3mms., diameter ·3mm., number of segments 24.

Locality: West Australia. Melville water, in the Swan River (salt-water), in sand at the water's edge.

East coast of Rottnest, on the ocean shore.

Princess Royal Harbour, Albany, between tide levels and at $5\frac{1}{2}$–9 metres.

4.—Family PHREODRILIDAE.

In 1904 Michaelsen proposed that the genera *Phreodrilus* (Beddard) and *Hesperodrilus* (Beddard) should be united and that they should be removed from the Tubificidae. This is the result of the discovery of two new genera showing definite relations to *Phreodrilus* and to each other. Benham established a new family for the reception of the members of this group so that the family Phreodrilidae, as now constituted, includes three genera, *Phreodrilus* Beddard, *Phreodriloides* Benham, and *Astacopsidrilus* Goddard, represented by species occurring in New Zealand, South America, Kerguelen Island, Tasmania, and Australia.

Goddard (1908) considers that the Phreodrilidae are the remnants of an old antarctic stock, and that they have been forced by climatic and competitive conditions to take to a subterranean life and to invade more temperate regions. He bases this suggestion on the condition of habitat, the small number of forms constituting the family, and the geographical distribution. If this supposition is correct it is interesting to note that a species has been found as far north as Kalamunda, 31° 40′ S., but here, it should be noted, with subterranean habitat. In all, nine specimens have been found, in a pool at the foot of Lesmurdie Falls after heavy rains. The pool is very small and dries up during the summer—in fact it is only during exceptionally wet seasons that it appears at all. The Phreodrilid, because of its transparency and minute size is difficult to see, and can only be found by collecting mud which must be carefully examined, a very little at a time. The first specimens were collected in 1926 but only one was successfully sectioned During the following winter season (1927) efforts were made to obtain more material, but several excursions to the pool resulted only in the finding of four specimens, all immature. It is however interesting to note that during both years the pool yielded specimens of two blind colourless crustacea (*Phreatoicoides plumosus* Nicholls and Milner, and *Protocrangonyx fontenalis* Nicholls), a colourless translucent planarian, and, on the last occasion, a colourless Gordioid worm. The natural conclusion is that these are all subterranean forms which have been forced to the surface by the uprush of flood water from some deep spring. The association of oligochaete, crustacean, and planarian is curious in that it also occurs in subterranean wells in New Zealand ; indeed it was there and in such association that Beddard found his first specimens of the genus *Phreodrilus*.

The fact that the *Phreodrilidae* either lead a subterranean life or are to be found in the depths of fresh-water lakes suggest that though they may be gradually invading warmer regions their conditions of habitat have not undergone much alteration. Even those forms occurring in New South Wales and Victoria live under Alpine conditions, *Phreodriloides* inhabiting Blue Lake, Mt. Kosciusko, and *Astacopsidrilus* living in association with fresh-water crayfish in regions high above sea level.

The specimens from Kalamunda described in the following pages are provisionally attributed to the genus *Astacopsidrilus* Goddard, though it was not found in association with crayfish, as were the other two species of the genus. This classification is based chiefly upon the curious duct-like struc-

tures in segment 12 which in their position and relation to the spermathecae show affinity with the funnel-structures described by Goddard (1908) in *Astacopsidrilus notabilis*. They are, however, much more specialised in the specimens here described. Probably of major importance are the facts that two pairs of testes occur and that, in some cases at least, both of the setae of the ventral bundle are of the bifid type. If further investigation confirms these facts there seems to be little doubt but that it will be necessary to establish a new genus for its reception.

Astacopsidrilus Novus, Sp. nov.

Pl. XVI. Figs. 1, 2, 3.

External features : The specimens taken were colourless and translucent, varying in length from 7–10 mms.

The ventral setae are arranged in bundles of two and are sigmoid without a nodulus. When the worms were first examined it was thought that both the setae of the ventral bundle were bifid but in revising the work later some doubt was cast upon the matter. Certainly in some cases both are bifid, though always the prong on the convex curve of the seta is shorter and more delicate than the other, but in some of the bundles one seta appears to be simple and slightly longer than the other ; whether this is actually the case or merely due to the angle at which the setae are lying and the difficulty of exact observation is a matter which cannot be settled until fresh specimens are obtained. If the bifid type of setae is constant for the ventral bundles it would seem to indicate that the species is more closely related to the Tubificidae than are the rest of the Phreodrilidae, where one of the ventral setae is always simple. The dorsal setae are long, slender, needle-like, and sometimes slightly curved. The first bundle contains two such setae but in segments 3–5 the number increases to 4 or 5 ; in the succeeding segments it diminishes again until from segment 13 onward only one needle-like setae occurs in each dorsal bundle.

The clitellum forms a cingulum round the posterior half of segment 12 and the whole of segment 13.

No pores could be distinguished without cutting serial sections, when it was found that the male pores lie in segment 12 at the interior margin of the clitellum and the female at the anterior margin of segment 13.

Anatomy : The septa are nowhere noticeably strengthened, while that between segments 11 and 12 seems to have broken down entirely.

The male genitalia is exceptional in that it includes two pairs of testes, one pair attached to the anterior wall of segment 10, the other in a similar position in segment 11 ; there is a pair of large spermiducal glands, and an extrusible penis, also paired. No spermiducal funnels or vasa deferentia could be distinguished in the sections. The presence of two pairs of testes distinguishes the species from the three known genera of Phreodrilids, but since the present description is based chiefly upon serial sections of one specimen it seems premature to separate the worm entirely from these forms. The testes are, however, extremely large and conspicuous and if further investigation shows that two pairs are constant in occurrence the feature will, together with other peculiarities, be sufficient to justify the establishment of a new genus.

The spermiducal glands are extremely large and project forward into segment 11 ending directly opposite the second pair of testes. They consist

remains of paired spermathecae which have fused, in which case he claims that his specimen represents a new genus ; otherwise it is probably a species of *Phreodrilus*. These chambers with their ellipsoid particles also seem to resemble the " opaque bodies " described by Stephenson (1909) as occuring in the Naididae. No satisfactory explanation of such structures has as yet been offered ; their appearance suggests that they may be masses of coelomic corpuscles concentrated in the genital region, but if this is so there seems to be no reason why a membrane should be developed about them.

6.—Family ENCHYTRAEIDAE.

1.—Genus ENCHYTRAEUS Henle, em. Michlsn.

Setae in 4 bundles, 2 ventral and 2 lateral, straight and of equal length in each bundle. Head-pore small, between the prostomium and segment 1 ; dorsal pores lacking. Dorsal vessel post-clitellial in origin ; blood colourless ; hearts lacking. Lymphocytes of uniform shape. Peptonephridia may or may not occur. Oesophagus gradually merges into the mid-gut. Duct of the nephridium usually very short, opening at the posterior end of the post-septal region. Vas deferens long. Spermathecae without a diverticulum and communicating with the gut.

Usually between tide levels, also in river banks, garden earth, etc. Nova Zembla, Europe, Greenland, Massachusetts, South Brazil, South Patagonia, South Georgia, India, South-West Australia.

Enchytraeus albidus, Henle.

Pl. XVI. Fig. 10.

In life milky-white or yellowish. Setae 3–5 rarely 6 per bundle, straight and of equal length. Brain longer than wide, anterior border concave, posterior border slightly concave, straight, or faintly convex with side margins very slightly divergent backwards. 1 pair of peptonephridia, consisting of unbranched irregularly-twisted ampullae opening into the gut dorsally just behind the pharynx. Lymphocytes flat and varying from an irregular oval to pear-shaped. Blood colourless or yellow. Nephridia with a small simple pre-septal region and a large broad elliptical post-septal region, the duct, which is nearly as long as the post-septal region, opening from the posterior pole. Seminal funnels 4–6 times as long as wide. The spermathecae with an irregular sac-like ampulla often swollen on one side only, and a distinct duct nearly as long as the ampulla, the distal half of the duct being beset with numerous closely-pressed pear-shaped glands.

Length 10–35 mms. ; diameter ·5–1mm. ; number of segments 53–74.

Locality : Albany, Princess Royal Harbour. At a depth of 5½–9m., Geraldton, on the ocean beach.

Albany, Princess Royal Harbour, between tide levels.

Nornalup, in a decaying *Macrozamia* on the shore of the Inlet.

Distribution : Nova Zembla, Solovetski Is., Denmark, Germany, Bohemia, Switzerland, Greenland, Massachusetts, Uruguay, South Patagonia, south coast of Tierra del Fuego, South Georgia, South-West Australia.

Remarks : Eisen ('04, fide Welch '14) in his definition of the genus *Enchytraeus* states that there is " no single penial bulb, but one or more isolated grandular papillae situated in the vicinity of the spermiducal pores, gener

of elongated glandular cells surrounding a narrow lumen ; apically the lumen widens into a distinct chamber which is filled with spermatazoa. Since no spermiducal funnels could be seen it was at first thought that they were represented by these chambers, the wall of the vas deferens being extremely thick and glandular. Close examination, however, failed to reveal any opening between the chamber and the body-cavity, and it was therefore concluded that the structure is prostatic in nature.

The penis sheath is extremely long and is built up of a muscle layer and a layer of indistinctly defined spongy-looking cells. One specimen was found after fixation to have the sheath of one side partially everted, but though the long sheath is eversible the penis proper can apparently only be extruded. The apex of the penis is sharp and the duct is surrounded by a thick cortex of spongy looking material in which no cell limits can be distinguished.

Well defined sperm sacs occur some distance behind the rest of the genitalia, apparently in segment 16, though owing to the curved condition of the specimen and the indistinctness of the septa it was not possible to be quite certain as to the segment. A quantity of ripening sperm matter was also found lying freely in the hinder region of segment 13 and in segment 14.

The ovaries project into segment 12 from the posterior surface of septum 11/12. The ova are large, irregular, and lightly granulated. They appear to develop in groups which break away from the ovary as they mature and finally separate into individual ova which lie free in the body cavity. Opposite each ovary is a large duct-like structure with an extremely wide lumen. This structure corresponds in position with the funnel-structures of *Astacopsidrilus* as described by Goddard (1908), but no oviduct could be made out in connection with it. The structure terminates in a hemispherical group of elongated glandular cells from the centre of the base of which two tiny sigmoid setae project into the lumen. The function of these setae is probably related to the act of copulation and the organ functionally a vagina. It extends backwards towards an atrium which opens to the exterior by a large pore at the anterior margin of segment 13, but the actual point of entry of the duct into the atrium could not be made out.

The spermathecae lie in segment 13, one slightly anterior to the other. They are ovoid structures lined by thin-walled irregular cells ; the ducts are stout and taper away as they approach the female atrium. These ducts for the greater part of their length contain a solid core which in transverse section was at first taken to be a spermatophore, but distally no lumen at all can be distinguished which suggests the possibility that a former connection with the exterior has degenerated into a solid strand of cells—a condition similar to that described by Goddard in *Astacopsidrilus*, though there a connection with the funnel-structures is retained. It seems impossible in the present case that this duct should have become solid, for if so the sperm would have no means of access to the spermathecae, where however, they are present in numbers.

Segments 13 and 14 contain large thin-walled ovoid chambers packed with tiny granular ellipsoid particles. The extent of these chambers varies and in one specimen they invade as many as five segments (11–15). Similar particles are described by Goddard (1908) in *Astacopsidrilus notabilis* ; he suggests that they may be derived from the epithelial lining of the spermathecal sacs, though he makes no suggestion as to their significance. He also found them in the immature worm collected from small pools on the Mount Wellington plateau, Tasmania, though here they were contained in numerous definite and regular spherical chambers. He suggests that they may be the

ally and principally ventral to the pores." Welch ('14) denies this since a single compact penial bulb occurs in *E. gillettensis* and *E. nodosus*, and also in *E. mobii* with which *E. albidus* is synonymus. He does not figure the bulb in *E. albidus*, merely stating that it agrees exactly with that of *E. mobii* as described by Michaelsen in his "Untersuchungen uber *Enchytraeus mobii* (Mich.) und andere Enchytraeiden," and that it consists of a number of facicles with a large central division of the lumbricillid type, *i.e.*, muscular strands do not penetrate the bulb. Since, however, the above work is not available, a "camera lucida" drawing has been made of a section through the penial bulb of one of the specimens from Nornalup. It will be noticed that there are no fasicles and that muscle strands do penetrate the glandular mass.

2.—Genus MICHAELSENA Ude.

Setae and setal-sacs decreased in number near the spermathecal pores, the few setae which occur being straight. Head-pore small, between the prostomium and segment 1. Lymphocytes all of the same shape. Peptonephridia lacking. Oesophagus simple, gradually merging into the mid-gut. Dorsal vessel post-clitellial in origin and devoid of hearts. Spermathecae without a diverticulum and communicating with the gut.

Between tide levels. South Patagonia, South Tierra del Fuego, and South-West Australia.

1.—*Michaelsena principissae*, Michlsn.

Setae large and straight except for a slight proximal bend. They are arranged singly, beginning ventrally on segment 3, dorsally on segment 14. The clitelium covers segments 12 and 13. The male pores are on small papillae. 3 pairs of septal glands occur with a number of secondary glands attached to the axial cord. The dorsal vessel arises from the gut-plexus in segment 13, or further back. The brain narrows considerably in front. It is at least twice as long as the maximum breadth, and has a deep median posterior indentation which divides it into 2 lobes converging to an angle of about 45°. The vas deferens in long and coiled and provided distally with a spherical penial bulb. The spermatheca is an inverted pear-shape containing four sperm chambers and communicating proximally with the oesophagus. The duct is about 3 times as long as its diameter, smooth, devoid of investing glands, and narrowing distally.

Length : 4½ mms. ; diameter ·15 mm. ; number of segments, 27.

Locality : Albany, Princess Royal Harbour, at low tide.

2.—*Michaelsena normani*, Michlsn.

Setae straight with a slight proximal curve, beginning ventrally on segment 3. Lateral setae only occur on segments 4–6. The setae of the anterior end paried but from segment 10 on they stand singly. The posterior setae are somewhat larger than the anterior, being about 33u in length, as against 20u. Anatomy not clear owing to lack of material.

Locality : Brunswick, in a brook.

3.—Genus FRIDERICIA Michlsn.

Setae in 4 bundles, straight and, if there are only 2 in a bundle, of equal length. If there are more in a bundle the innermost 2 are of equal length and shorter than the next pair, so that the two outermost setae are the longest. Dorsal pores occur usually from segment 7, rarely from 6. Head-

pore usually small and placed dorsally between the prostomium and segment 1. Lymphocytes of two kinds. Peptonephridia always present. The oesophagus merges gradually into the mid-gut. Dorsal vessel post-clitellial in origin ; blood colourless. Nephridia usually with a large pre-septal region in which the duct begins its convolutions. Vas deferens long. Spermathecae usually communicate with the gut and may be simple or with a diverticulum.

In earth, under moist leaves, moss, etc. Siberia, Nova Zembla, Spitzbergen, Europe, North America, South Brazil, Uruguay, Chili, New Zealand, South-West Australia, India, Natal. Probably cosmopolitan.

Fridericia galba, Hoffm.

In life greyish-white to yellowish, slightly transparent. The setal bundles consists of 4–6, rarely 3 setae. Brain twice as long as wide, faintly convex before and behind. Peptonephridia broad and band-like with a slight dicotomous branching posteriorly. The dorsal vessel arises behind the clitellum. Nephridia with a large oval anteseptal region and a post-septal region which varies from the same size to 3 times the length ; the duct passes out laterally, just before the hinder end of the post-septal region. Seminal funnels 3–4 times as long as wide, with a narrow turned-back lip. Spermathecae communicate with the gut and consist of a large sugar-loaf-shaped ampulla into the base of which open 3–5 (usually 4) stalked spherical diverticula, and a slender duct about twice as long as the ampulla.

Locality : Albany, in rich marshy earth.

Distribution : Europe and New Zealand.

8.—Family HAPLOTAXIDAE.

Genus PELODRILUS Bedd., emend.

Setae in 4 pairs in each segment. Nephridial pores in the line of the ventral pair of setae. Clitellum covering several segments. 2 pairs of male pores ; 1 pair of spermathecal pores in furrow 6/7 or 7/8. Oesophagus simple, without a gizzard or glandular appendages. Testes and seminal funnels may or may not be enclosed in a sperm reservoir.

Terrestrial : New Zealand and South-West Australia.

1.—*Pelodrilus darlingensis*, Michlsn.

Unpigmented and translucent, the head region with a reddish-yellow tone. Head zygolobous with a short broad prostomium. Setae ventral and lateral in position and closely paired. Male pores in segments 11 and 12 in the *b* line of setae ; 1 pair of female pores in furrow 12/13 ; spermathecal pores in furrow 7/8 slightly above the *c* line of setae. Large lobed salivary glands in segments 5–9, the ducts extending as thick cords to open through the dorsal pharynx. Nephridia occur from segments 5, including the genital segments. Sperm reservoir lacking ; 2 pairs of testes and seminal funnels in segments 10 and 11 ; 2 pairs of sperm sacs in segments 9 and 12, and free sperm masses in 10 and 11 ; spermiducal glands lacking. 1 pair of ovaries in segment 12. Spermathecae with a fairly long sac-like ampulla and a short narrow duct. Length 25–35mms. ; diameter, 1–1 1/3mm. ; number of segments 80–95.

Locality : Collie, in marshy ground at the margin of a brook.

2.—*Pelodrilus hologynus*, Michlsn.

Generally grey, the white nephridia being visible through the skin, head region yellowish-white. Head zygolobous with a dome-like prostomium marked by a ring-like furrow which fades away laterally. 2 pairs of male pores in segments 11 and 12 in the line of the ventral setae ; 2 pairs of female pores in furrows 12/13 and 13/14 , spermathecal pores in furrows 6/7. Lobed salivary glands in segments 5–9 ; the oesophagus is swollen in these same five segments.

Nephridia first occur in segment 8 and are present in every succeeding segment (with the exception of the segment containing the ovaries?). Sperm reservoirs lacking , 2 pairs of testes and seminal funnels in segment 10 and 11, free, or embedded in free sperm masses ; 2 pairs of sperm sacs in segments 9 and 12 , Vasa deferentia coiled and opening on each side in the region of a nodular group of pear-shaped copulatory glands. 2 pairs of ovaries and oviducal funnels in segments 12 and 13. Spermathecae with a long twisted ampulla merging into a short narrow curved duct.

Length, 48–50mm. ; diameter about 1mm. ; number of segments, about 130.

Locality : Yarloop.

Harvey, in moist rich earth on the bank of a brook.

10. Family MEGASCOLECIDAE.

1.	1 pair of calciferous glands or oesophageal pouches in segment 9, sometimes united mid-ventrally ...	3. SUB-FAM. OCNERODRILINAE.
	Calciferous glands not, or not solely in segment 9—2.	
2.	2 or 3 gizzards anterior to the testes-segments—3.	
	1 or no gizzard before the 1st testes-segment—4.	
3.	Plectonephridial	4. SUB-FAM. TRIGASTRINAE.
	Meganephridial	5. SUB-FAM. DIPLOCARDIINAE.
4.	Spermathecal pores posterior to furrow 8/9, sometimes united with the female's pores	6. SUB-FAM. EUDRILINAE.
	Spermathecal pores in or anterior to furrow 8/9, sometimes lacking—5.	
5.	Vas deferens and spermiducal glands entirely separated or at most opening close to each other—6.	
	Vas deferens opens into the spermiducal gland except when the latter is lacking	2. SUB-FAM. MEGASCOLECINAE.
6.	Plectonephridial	7. SUB-FAM. OCTOCHAETINAE.
	Meganephridial	1. SUB-FAM. ACANTHODRILINAE.

1.—Sub-family ACANTHODRILINAE.

1. Genus EODRILUS Michlsn.

8 setae per segment. Nephridial pores in a longitudinal line on each side, not alternating. Male pores in segment 18. Spermiducal glands opening by 2 pairs of pores in segment 17 and 19. Usually 2 pairs of spermathecal pores in furrows 7/8 and 8/9, rarely 4 median pores (or 3 pairs?). Gizzard well developed. 2 pairs of testes and seminal funnels projecting freely into segments 10 and 11.

Cape of Good Hope, Mexico, Colombia, Chile, Patagonia, New Caledonia, North and West Australia, Madagascar, West Africa (Cameroon).

Eodrilus cornigravei, Michlsn.

Grey and unpigmented, the white nephridia being visible through the skin. Setae closely paired ($ab = cd = \frac{1}{4}aa$, $aa = bc$, $dd = \frac{7}{12}u$). Head epilobous. Dorsal pores not known. Nephridial pores of the anterior segments are immediately below the *c* line of setae, while further back they are in the line *cd*. Male pores not known and setae of segment 18 all normal. Spermiducal glands open to the exterior in the line of the ventral pairs of setae. 2 pairs of spermathecal pores in furrows 7/8 and 8/9 immediately lateral to the the *a* line of setae ; ventral setae of segments 8 and 9 modified as genital setae, and are marked on the distal half by 4 irregular longitudinal

rows of low rounded scars. The distal tip is claw-like, swelling out slightly just before the point and marked by 2 longitudinal ridges. Septa 5/6–13/14 thickened. Gizzard in segment 5 ; mid-gut begins in segment 13. Last heart in segment 12. 2 pairs of sperm sacs in segments 9 and 12 ; spermiducal glands long and thread-like, irregularly twisted at the proximal end. Penial setae occur in segments 17 and 19. They are marked by scar-like grooves with irregularly-toothed distal margins. The distal end is irregularly bent and tapers to a sharp point. Spermathecae ampulla-shaped or sac-like, merging into the duct ; a diverticulum with a sacculated lumen opens into the distal region of the ampulla.

No fully mature specimen has yet been examined. Length, 85mms. ; diameter, 2mms. ; number of segments, about 200.

Locality : Cannington, in swampy ground.

2. Genus MICROSCOLEX Rosa, emend.

8 setae per segment. Nephridial pores in a longitudinal line on each side. Male pores in segment 17 or 18. Pores of the spermiducal glands, 1 or 2 pairs in segment 17 or in 17 and 19. 1 or 2 (or 3?) pairs of spermathecal pores (exception, *M. dubius*) the last in furrow 8/9. Gizzard rudimentary or lacking (known only as a slight strengthening of the muscles of the gut visible in serial sections). 2 pairs of testes and seminal funnels projecting freely into segments 10 and 11.

Cape of Good Hope, Darien, Tierra del Fuego, South America, Falkland Is., Auckland Is., Antipodes Is., Campbell Is., Macquarie Is., New Zealand, Australia, Tasmania, Algiers, Canary Is., Madeira, Europe, North America.

1. *Microscolex dubius*. (Fletcher.)

In life a yellowish flesh-colour with a transparent skin ; unpigmented. Head epilobous (?). Setae set far apart ; setal distance $aa = 2\,ab$, $ab < cd$, $cd < bc$; ab is smaller near the male pores. Nephridial pores in line d in segments 2–4 ; further back they lie just beneath c. Dorsal pores lacking. Clitellum complete, covering segments 13–17 ; male pores between the a and b lines of setae. Septa 5/6–14/15 thickened. Gizzard rudimentary, in segment 5. Mid-gut without a typhlosole. Last heart in segment 12. 2 pairs of racemose sperm-sacs in segments 11 and 12 ; spermiducal glands with a very short duct. Penial setae 1mm. long, quite straight with a somewhat obliquely truncate distal point, ornamented with very delicate transverse lines. Spermathecae lacking.

Length, 45–70mms. ; diameter, 3–5mms. ; number of segments 85–120. Very common in South-West Australia.

Distribution : World-wide.

2. *Microscolex phosphoreus*. (Ant. Dug.)

Unpigmented and in life phosphorescent. Head epilobous ($\frac{1}{2}$). Setae far apart ; setal distance $aa = 2ab = bc$, $cd < bc$, $dd = 2\,bc$. Nephridial pores of segments 2–4 in the d line of setae, further back they lie just beneath c ; dorsal pores are lacking. Clitellum complete, covering segments 13–16 or 17 (4 or 5 segments). Spermathecal pores in furrow 8/9 ; genital pores all in the a line of setae. Gizzard rudimentary ; mid-gut without typhlosole. Last heart in segment 12. 2 pairs of sperm sacs in segments 11 and 12 ; penial setae slender and delicate, faintly bent, irregularly biset with small broad flattened teeth. Spermathecae with a short club-shaped diverticulum. Length, 10–35mms. ; diameter 1–2mms. ; number of segments, 75–90.

Locality : Cannington.

Distribution : World-wide.

SUB-FAM. MEGASCOLECINAE.

KEY TO THE GENERA OF THE MEGASCOLECINAE.

- Spermiducal gland elongated and tubular, with a simple unbranched canal
  - Meganephridial...
    - 8 setae per segment
      - Gizzard well developed
        - Male pores and spermathecal pores paired ... 1. *Plutellus.*
        - Male pores and spermathecal pores unpaired... 8. *Fletcherodrilus.*
      - Gizzard rudimentary ... ... 2. *Pontodrilus*
    - At least in the middle and hinder part of the body, many (more than 8) setae per segment ... ... 9. *Diporochae*
  - Micronephridial at least in the anterior region of the body
    - 8 setae per segment ... ... 3. *Megascolia*
    - At least in the middle and hinder part of the body, many (more than 8) setae per segment ... ... 10. *Spenceriell*
- Spermiducal gland with a branching canal system
  - Meganephridial ...
    - 8 setae per segment ... ... 4. *Woodward*
    - At least in the middle and hinder part of the body, many (more than 8) setae per segment
      - Gizzard well developed ... 11. *Perionyche*
      - Gizzard rudimentary ... ... 12. *Perionyx.*
  - Micronephridial at least in the anterior region of the body
    - 8 setae per segment
      - 1 gizzard ... ... 5. *Notoscolex.*
      - 2 gizzards ...
        - 2 pairs of spermathecae ... 13. *Digaster*
        - 3 pairs of spermathecae ... 14. *Didymogast*
      - 3 gizzards ... ... 15. *Perissogast*
    - At least in the middle and hinder part of the body, many (more than 8) setae per segment
      - Only 1 gizzard before the testes-bearing segments
        - Gizzard before segment 8 ... 6. *Megascolex.*
        - Gizzard in segment 8 ... 7. *Pheretima.*
      - Several gizzards at the beginning of the mid-gut in addition to 1 small gizzard in segment 8 ... ... 16. *Plionogaste*

1. Genus PLUTELLUS E. Perrier.

Eight setae per segment. Male pore paired. Spermathecal pores usually paired, 2–5 pairs, the last in furrow 8/9. One gizzard in the region of segments 5–7. Always meganephridial. Spermiducal gland long and cylindrical with a simple unbranched canal.

Australia, Tasmania, India, Ceylon, North America.

1. Spermathecal pores unpaired ... ... 11. *P. asymmetricus.*
   Spermathecal pores paired—2.
2. 2 pairs of spermathecal pores—3.
   3 pairs of spermathecal pores—12.
3. Spermathecae with a variable number of diverticulae ... 14. *P. varicystis.*
   Spermathecae with a constant number of diverticulae—4.
4. Spermathecae with 1 diverticulum—6.
   Spermathecae with 2 diverticulae—5.
5. Penial setae with a simple point ... ... 1. *P. termitophilus.*
   Penial setae with a bifid point ... ... 2. *P. wellingtonianus.*
6. Lumen of diverticulum of spermatheca asymmetrical ... 3. *P. strelitzi.*
   Lumen of diverticulum of spermatheca symmetrical—7.
7. Diverticulum of spermatheca containing sperm chambers—8.
   Diverticulum of spermatheca simple—9.
8. Spermathecal duct sharply defined ... ... 6. *P. murrayensis.*
   Spermathecal duct indistinct ... ... 4. *P. woodwardi.*
9. Spermathecal pores in the *b* line of setae—13.
   Spermathecal pores medial to the *b* line of setae—10.
10. Only median unpaired accessory glands occur ... 8. *P. blackwoodianus.*
    Paired accessory glands occur ... ... 11.
11. Head epilobous ... ... 9. *P. schumanni.*
    Head pro-epilobous ... ... 10. *P. carneus.*
12. Spermathecae with distinct diverticulae ... ... 5. *P. levis.*
    Spermathecae with basal lobes ... ... 12. *P. ?.*
13. Glandular markings occur in the region of the spermathecal pores ... ... 13. *P. candidus.*
    Glandular markings do not occur in the region of the spermathecal pores ... ... 7. *P. mendilai.*

1. *Plutellus termitophilus*, Michlsn.

Yellowish grey in the ante-clitellar and hinder regions, the middle body being a patchy green-gray due to the gut-contents being visible through the skin. Head epilobous. Setae wide apart, $aa = 2\ ab$, $bc = 1\frac{1}{2}\ ab$, $cd = 1\frac{1}{3}\ ab$, $dd = 2aa = \frac{1}{3}\ u$; the ventral pairs narrow towards the male pore ; setae of the hinder end irregularly arranged. First dorsal pore in furrow 6/7 though rudimentary pores occur in 5/6 or 4/5 and 5/6. Clitellum saddle-shaped and covering segments 14–17, but furrows, setae, and dorsal pores are visible in these 4 segments. Male pores in the form of fine slits of which the medial end reaches to the *b* line of setae ; female pores immediately anterior to seta *a*, on transverse papillae united by a median bridge ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9 just above the *b* line of setae, conspicuous because on small papillae. Accessory glands in the form of oval transversely-elongated, intersegmental areas of which only the anterior and posterior borders are marked, and which bear tiny papillae. These areas are ventral-median and unpaired in furrows 12/13–16/17, the first 2 bearing 3 papillae, the rest 1 papilla each ; paired and bearing 1 papilla in 17/18–21/22, the distance between them widening then narrowing again ; median and ununpaired and bearing 1 papilla in 22/23 and 23/24. Only the first 2 areas and those in 17/18–20/21 are constant. Septa 6/7–14/15 thickened. Gizzard in segment 5. Distinct calciferous glands lacking, but the dilatation in 16 has slight dorsal sacculations. 2 pairs of testes and seminal funnels projecting freely into segments 10 and 11 or embedded in free sperm masses ; 2 pairs of sperm sacs in segments 9 and 12 ; spermiducal glands coiled, with a distinct s-shaped muscular duct. Penial setae delicate, irregularly curved, sharply pointed distally, and covered, except for the extreme end with moderately coarse scattered thorns. Spermathecae irregular and cylindrical opening directly to the exterior through a narrowing of the distal end ; 2 elongated ampulla-like diverticula opening opposite each other into the narrowing distal end of the main pouch, while a third may be present, opening further up.

Length, 50–65mms. ; diameter, 3–3½mms. ; number of segments, 130–150.

Locality : Fernbrook (formerly Lunenberg), in the wall of a termite nest.

2. *Plutellus wellingtonianus*, Michlsn.

Colour, a dirty gray. Head epilobous. Setae set far apart anteriorly : $ab = \frac{1}{2}\ aa$, $bc = \frac{9}{10}\ aa$, $cd = \frac{7}{9}\ bc$, $dd = \frac{1}{3}\ u$; posteriorly slightly closer together. First dorsal pore in furrow 5/6 ; male pores in segment 18 on small transversely-oval papillae in the *b* line of setae ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9 in line *b*. The accessory glands are in the form of transversely-elongated intersegmental glandular fields, unpaired and ventral-median in furrow 18/19, paired and connected by ventral-median bands in 11/12, 12/13, 17/18, 19/20 and 20/21. Septa slightly thickened in the region of the testes. Gizzard in segment 6 ; oesophagus without calciferous glands. Last heart in segment 12. Two pairs of seminal funnels lying freely in segments 10 and 11 ; a pair of slender multi-lobed sperm sacs in segment 12. Spermiducal glands much twsited with a moderately short muscular duct as thick as the glandular region. Penial setae with a double bend at the distal end, irregularly beset with thorns, and with a tip which bifurcates into two widely divergent tips. Spermathecae long, sac-like, and irregularly bent, with a short sharply-defined duct ; 2 small tubular diverticula open opposite each other into the distal end of the ampulla.

Length, more than 25mms. ; diameter, $1\frac{1}{2}$–2mms. ; number of segments more than 68.

Locality : Collie, in moist rich earth.

Remarks : Only one much-damaged mature specimen, without a clitellum, and one immature specimen probably of the same species, were found

3. *Plutellus strelitzi*, Michlsn.

Body stout, unpigmented and grayish in colour. In life with a faintly pink head region ; clitellum orange. Head pro-epilobous, $aa = 2\frac{1}{2}\ ab$, $ab = \frac{4}{7}\ bc$, $bc \geq cd$. Setal line *d* slightly irregular : posteriorly the setae all become irregular. First dosal pore in furrow 4/5. Clitellum saddle-shaped and covering segments 13–18. Male pores on narrow transversely-oval papillae in the *b* line of setae in segment 18 ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9, slightly above the *a* line of setae. Accessory glands consist of very tiny paired linear papillae in furrows 16/17 and 19/20 in line *a*, often indistinct or lacking, sometimes 2 smaller pairs occur, in furrows 15/16 and 20/21. Septa 7/8–11/12 thickened, 6/7, 12/13 and 13/14 very slightly so. A very large gizzard occurs in segment 5 ; oesophagus with a pair of large kidney-shaped calciferous glands in segment 17 ; mid-gut begins in segment 18. Last heart in segment 12. Two pairs of testes and seminal funnels in segments 10 and 11 embedded in free seminal masses ; a pair of large racemose sperm sacs in segment 12, and a tiny simple pair in segment 9 ; spermiducal gland with a very small duct ; penial setae curved in an arc with a backwardly-bent, flattened or slightly hollowed distal end which is constricted distally then widens again to two horns which form a small crescent across the top of the setae. The distal half of the setae is beset on the convex curve with tiny thorns. Spermathecae thick short and irregularly bent with a large leaf-like diverticulum opening laterally into the distal end of the duct ; the lumen of the diverticulum is lateral in position, giving out branches which extend across the width of the diverticulum.

Length, 50–65mms. ; diameter, 6–7mms. ; number of segments, 155–160,

Locality : Lion Mill, in moderately dry gravelly earth.

4. *Plutellus woodwardi*, Michlsn.

Colour, yellowish, or brownish-gray ; in life whitish, the head end faintly red. Head pro-epilobous (?) ; segment 1 with a longitudinal dorso-medial furrow. Setae : $aa = 3\ ab$, $ab = \frac{1}{2}\ bc$, $bc = \frac{4}{3}\ cd$, $dd = \frac{1}{2}u$ (roughly) ; setal line *d* becomes irregular posteriorly. First dorsal pore in furrow 4/5. Male pores in segment 18 on small oval papillae in setal line *b* ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9 in setal line *a* ; Accessory glands in the form of indistinct glandular patches in the line *ab* in furrows 15/16, 16/17, 18/19, and 19/20, the last two pairs sometimes with ventral-median connections. Septa 3/7–13/14 thickened. Gizzard large, in segment 5 ; oesophagus without calciferous glands, but swollen in segments 16 and 17. Mid-gut begins in segment 18 and has a very small typhlosole. Last heart in segment 12. One pair of racemose sperm sacs in segment 12, and a small simple pair in 9 ; two pairs of seminal funnels projecting freely into segments 10 and 11 ; spermiducal glands thick and irregularly curved, and beset distally with thorns ; at the distal tip the seta is flattened at each side forming two lateral seams at right angles to the plane of the curve, which extend in front of the point, their junction being marked by a small notch. The main pouch of each spermatheca is stout, tubular, and irregularly bent, and is filled with a

glanulated mass and several darker irregular bodies ; it merges into a short duct, the lumen of which is somewhat twisted ; the diverticulum, which opens distally into the duct, is thick and tubular, the proximal end swollen and somewhat lobed owing to the presence of 2 or 3 sperm chambers.

Length, 90–100mms. ; diameter, $4\frac{1}{2}$–6mms. ; number of segments, 160–166.

Locality : Collie.

5. *Plutellus levis*, Michlsn.

Colour, clear gray. Head epilobous. Setae widely separated : $aa = 1\frac{1}{2}ab = bc = cd = \frac{1}{2}\,dd$. First dorsal pore in furrow 4/5. Clitellum saddle-shaped, covering segments 13–18. Male pores immediately ventral to the *a* line of setae on distinct oval papillae in segment 18 ; 3 pairs of spermathecal pores in furrows 6/7 – 8/9 in the *a* line of setae. No accessory gland known. Septa 9/10–12/13 faintly thickened. Gizzard in segment 6 ; oesophagus wrinkled and with a rich blood supply in segments 7–14, and in 14 with an annular sacculation which resembles a calciferous gland ; similar but smaller sacculations occur in segments 13, 12, and 11. Last heart in segment 12. 2 pairs of testes and seminal funnels in segments 10 and 11 ; 2 pairs of sperm sacs in segments 9 and 12, the foremost sac-like, the hinder racemose. Spermiducal gland closely coiled with a short narrow duct ; penial setae irregularly bent and very delicate ; the distal tip is flattened and rounded and the convex curve immediately below this tip is beset with tiny teeth which are extremely difficult to make out. The spermathecae are irregular, sac-like and flattened, merging into a short duct ; a small pear-shaped diverticulum opens into the distal end of the ampulla ; a second still smaller diverticulum may occur, opening immediately below the first.

Length, 55mms. ; diameter, $2\frac{1}{2}$mms. ; number of segments, 121.

Locality : Cannington.

6. *Plutellus murrayensis*, Michlsn.

Colour, a dirty yellow, or green-gray, the head region faintly brown or flesh-coloured. Head epilobous. Setae faintly ornamented distally. $ab : bc : cd : = 14 : 15 : 13$; $aa = ab + bc + cd$; $dd = \frac{1}{2}\,u$. First dorsal pore in furrow 5/6. Clitellum complete, but only slightly developed ventrally, covering segments 13–17. Male pores just below *b*, on oval papillae ; spermathecal pores, 2 pairs in the *a* line of setae in furrows 7/8 and 8/9. Indistinctly-bounded glandular pads occur in the ventral-median region of segments 8 and 9, a pair of oval papillae between lines *a* and *b* in segment 17, and unpaired long narrow thickenings ventral-median in furrows 19/20 and 20/21. Septa 8/9–11/12 faintly thickened. Gizzard in segment 5 ; oesophagus with a wrinkled vascular wall in segments 10–16, widening considerably in 16. Last heart in segment 12. 2 pairs of testes and seminal funnels in segments 10 and 11 ; 1 pair of simple sperm-sacs in segment 9, and 1 pair, compressed and racemose, in segment 12; spermiducal glands with an irregular and loosely wound glandular region and a distinct short duct. Penial setae long, delicate, and irregularly bent ; the distal end is flattened, with a convex terminal margin tipped by a tiny curved tooth ; with the exception of this flattened region the distal end is marked by two somewhat irregular, longitudinal rows of teeth. Spermathecae irregular and sac-like with a sharply defined duct, into which, half-way down its length, opens a sausage-shaped diverticulum containing 2 or 3 ill-defided sperm-chambers.

Length, 42–54mms. ; diameter, 2–3mms. ; number of segments, 109–114.

Locality : Jarrahdale.

7. *Plutellus mendilai*, Michlsn.

Unpigmented, a clear or a dirty gray due to the gut contents being visible through the body-wall. Head epilobous. Setae : $aa = \frac{5}{3}\ ab$, $ab = \frac{2}{3}\ bc$, $bc = \frac{3}{4}\ cd$, $cd = \frac{2}{3}\ dd$, $dd = \frac{2}{9}\ u$. First dorsal pore in furrow 4/5. Clitellum saddle-shaped, covering segments 13–17. Male pores in segment 18 on small indistinct papillae in the *b* line of setae ; female pores apparently on a glandular wall extending from *a*–*a* in segment 14 ; spermathecal pores, 2 pairs in furrows 7/8 and 8/9 in the *b* line of setae. 4 pairs of transversely elongated thickenings deeply cut by the intersegmental furrows in 11/12, 12/13, 20/21, and 21/22 in the line *ab*. Septa 6/7–10/11 moderately thickened. Gizzards in segment 6 ; oesophagus thick, swollen, and longitudinally striped in segment 16, the internal structure resembling that of a calciferous gland ; mid-gut begins in segment 17, and is broad with a distinct typhlosole. 2 pairs of testes embedded in free seminal masses in segments 10 and 11 ; 2 pairs of large sperm sacs in segments 9 and 12, the former simple, the latter multi-lobed. Spermiducal glands in segment 18, or in 17 and 18, with a thick coiled glandular region and a short s-shaped duct. Penial setae delicate and curved, the distal end flattened, slightly widened, truncate and curved at the sides so as to resemble a spatula or a scoop. Spermathecae with a large irregular sac-like ampulla about 3 times as long as the duct ; a thick club-shaped diverticulum opens about half-way down the duct.

Length, 30–35mms. ; diameter, 2–2½mms. ; number of segments, 78–98.

Locality : Eradu.

8. *Plutellus blackwoodianus*, Michlsn.

Colour, a dirty white, the gray gut-contents, nephridia, and spermiducal glands being visible through the skin. Head epilobous. Setae wide apart anteriorly, closer together posteriorly : anteriorly *aa* : *ab* : *bc* : *cd* : *dd* = 14 : 6 : 12 : 9 : 27 ; posteriorly, *aa* : *ab* : *bc* : *cd* : *dd* = 9 : 6 : 7 : 7 : 14. First dorsal pore in furrow 6/7. Male pores in segment 18, apparently in the *a* line of setae ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9 apparently medial to line *a*. Oval, ventral-median glandular fields each bearing a small central papilla occur in furrows 12/13, 16/17, and 19/20. Septa in the testes-region slightly less delicate than the rest. Gizzard in segment 6 (?) ; oesophagus without calciferous glands. 2 pairs of testes and seminal funnels in segments 10 and 11; 1 pair of sac-like sperm sacs in segment 12 (a second pair further forward ?) ; spermiducal glands long and coiled, the coils becoming tightly pressed together towards the duct, which is short and narrow. Penial setae curved, gradually tapering distally ; the distal end is flattened and slightly wider, with an uneven outline ; except for the flattened region the setae are beset with irregular rings of teeth. Spermathecae with a sac-like ampulla merging into a duct which narrows distally ; the diverticulum opens into the distal end of the ampulla.

Length, 18–28mms. ; maximum diameter, 1·3mms. ; number of segments, 90–95.

Locality : Bridgetown.

9. *Plutellus schumanni*, Michlsn.

Colour, yellowish-white, the gray gut-contents visible through the skin ; in life the worm has a reddish tint. Head epilobous. Setae set very wide apart : $aa = 2ab$, $ab = \frac{2}{3}\ bc$, $bc \geq cd$, $dd = 2aa$. Dorsal pores occur but are indistinct. Clitellum complete but thinner in the ventral-median line,

covering segments $\frac{1}{3}$ 13 or 14–17. Male pores on oval papillae in segment 18, between the *a* and *b* lines of setae ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9 slightly lateral to line *a*. Two pairs of large ventral-median oval areas with raised margins and sunken centra in furrows 13/14 and 14/15; 2 or 3 pairs of papillae in the anterior regions of segments 19 and 20, or 19, 20, and 21, the hindermost between lines *a* and *b*, the others slightly more lateral ; these papillae are connected in pairs by a ventral-median glandular field in each segment. Septa 6/7–13/14 thickened. Gizzard in segment 6 ; oesophagus swollen in each segment but without calciferous glands. 2 pairs of irregular sperm sacs in segments 9 and 12 ; 2 pairs of seminal funnels in segments 10 and 11 ; spermiducal glands with a very thick coiled glandular area somewhat flattened by the pressing together of the coils, and a sharply-defined short bent duct. Penial setae lacking. Spermathecae with a pear-shaped ampulla the proximal swollen end of which is bent to the side ; the ampulla narrows distally to the duct which is extremely small and entirely hidden in the body-wall ; a simple diverticulum opens into the distal end of the ampulla.

Length, about 40mms. ; maximum diameter, 2–2½mms. ; number of segments, about 120.

Locality : Albany.

10. *Plutellus carneus*, Michlsn.

Colour, white and unpigmented, in life flesh-pink. Head pro-epilobous. Setae wide apart : $aa = 2\ ab = bc = \frac{4}{3}cd = \frac{2}{5}\ dd$. First dorsal pore in furrow 6/7 ; male pores on oval papillae the centra of which are practically in the *b* line of setae ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9 in the *a* line of setae. Paired oval papillae occur in furrows 10/11, 16/17, 17/18 and 18/19, nearly between the *a* and *b* lines of setae. Septa 5/6–11/12 thickened. Gizzard small, in segment 5 ; oesophagus simple, without calciferous glands, 2 pairs of seminal funnels in segments 10 and 11 ; 1 pair of racemose sperm sacs in segment 12 ; spermiducal glands with an irregularly coiled glandular region about 8–10 times as long as the duct. Penial setae lacking. Spermathecae with a long sac-like ampulla merging into a short duct which is entirely hidden in the body-wall ; the diverticulum is simple and opens into the distal end of the ampulla.

Length, 90 mms. ; maximum diameter, 3 mms. ; number of segments, about 190.

Locality : Albany.

Remarks : Only one specimen of this worm has been found.

11. *Plutellus asymmetricus*, Michlsn.

Head epilobous. Setae wide apart : $aa = \frac{3}{2}\ ab = \frac{4}{3}\ bc = \frac{4}{3}\ cd$; $dd = \frac{4}{5} = \frac{4}{7}\ u$. First dorsal pore in furrow 5/6. Clitellum complete, covering segments 14–17. Male pores indistinct in segment 18 (in line *a* of setae ?) ; 2 unpaired ventral-median spermathecal pores in furrows 7/8 and 8/9. Elongated ventral-median glandular fields, extending almost to the *b* line of setae on each side, occur in segments 13, 14, 16 and 18 or only on 13 and 18 ; the margins of these fields, or only the lateral margins and those distal to the male pores, are thickened and glandular and the centrum of each field is marked by a tiny papilla. Septa 9/10–11/12 moderately thickened. Gizzard in segment 6 (?·5?) ; oesophagus simple and sacculated

segmentally, without calciferous glands. Last heart in segment 12. 2 pairs of seminal funnels in segments 10 and 11 ; 3 pairs of irregular sac-like sperm sacs in segments 9, 11, and 12 ; spermiducal glands large and tightly coiled with a very short delicate duct. Penial setae apparently lacking. Spermathecae unpaired ; the ampulla is sac-like, irregular, and doubled over, the distal part fairly distinct and narrower (duct ?) ; the diverticulum contains 2 sperm chambers the division between which is marked externally by a notch, and opens into this narrow region of the ampulla.

Length, 27–35 mms. ; diameter, 2–2¾ mms. ; number of segments, 95–106.

Locality : Albany.

Plutellus sp. Michlsn.

Locality : Dongarra.

Remarks : Only one specimen was found, and this differed from all known species, but unfortunately it was lost. It is mentioned because it was found further north than any other *Plutellus*.

12. **Plutellus dalgarangae,** Sp. nov.

Two immature specimens of Plutellus were found under rocks on a hillside at Dalgaranga Station, east of Yalgoo. The larger measured 45 mms., and was slightly less than 2 mms. in thickness, consisting of 92 segments. The worms are of a creamy flesh-colour, the contents of the gut showing through the body-wall and imparting a gray tinge. There are three pairs of spermathecae widely set in segments 7, 8, and 9, opening to the exterior at intersegments 6/7, 7/8, and 8/9. They are ampulla shaped and merge gradually into the duct. There is no diverticulum but on either side of the base of the ampulla is a swelling larger, more distinct, and rather more proximally placed on one side than on the other. A pair of developing sperm sacs was seen in segment 12. There is a moderately large gizzard in segment 5 and in segment 14 the wall of the oesophagus is divided longitudinally into a number of lobes having a rich blood supply.

It is not possible without further material to give a more detailed description, but the species is evidently a new one, for though it resembles *Plutellus levis* Michlsn in the structure of the oesophagus in segment 14 and also in having 3 pairs of spermathecae, these spermathecae are of a different type and the gizzard occurs a segment earlier. Also the specimens were found further north in a much drier region.

Michaelsen notes as an interesting fact that he found a *Plutellus* (the species of which he was for reasons stated unable to determine) as far north as Dongarra. The two specimens from Yalgoo, however, were still further north and much further inland.

13. **Plutellus candidus,** Sp. nov.

Pl. XV. Figs. 9, 12, 13. Text-fig. 6.

External features : Length, 100 mms. ; breadth, 5 mms. ; number of segments about 140.

In life the worm is colourless and unpigmented, though the red blood, which is visible through the skin, gives it a somewhat pinkish tinge. After preservation in alcohol it becomes white and opaque.

Each of the segments of the body, from number 7 onwards, is marked by two annuli which divide it into three approximately-equal bands, the setae being borne on the middle band. In segment 6 the second annulus is incomplete, while in segment 5 only one occurs, the setae being borne on the broader posterior band. Segments 1–4 have no annuli at all. Posterior to the clitellum the annuli are faint, but in the clitellar region they are deeply marked and make it extremely difficult to distinguish the segments.

The head is prolobate and the peristomial segment has a mid-dorsal longitudinal groove. This groove has a very small anterior bifurcation which encroaches on the prestomium.

The setae are very difficult to see, owing to the whiteness of the body, but they appear to be fairly widely set.

The first dorsal pore lies between segments 5 and 6.

The clitellum is distinct and saddle-shaped, covering segments 13–17, extending ventrally as far as the *b* line of setae.

The male pores could not be distinguished, but they presumably lie in the papillae which extend between the *a* and *b* lines of setae on each side of segment 18. Judging by the position of the duct of the spermiducal gland as seen in the dissection and by the fact that the papillae mentioned are somewhat thicker and more pronounced on the outer side, it would seem that the pores are either in or very close to the *b* line of setae.

The female pores have very slightly thickened lips and can be seen between and slightly in front of setae *a*, *b*, in segment 14.

The spermathecal pores are also indistinguishable. Dissection shows that there are two pairs lying in or near the *b* line of setae at intersegments 7/8 and 8/9.

The accessory glands consist of a pair of circular glandular papillae in setal line *b* at intersegment 16/17 and a pair of tiny and almost contiguous glandular patches in an elongated ventral-median papilla at intersegment 18/19. The posterior third of segment 17 is thickened transversely to form a sort of ridge and the two ventral pairs of setae in segment 19 are prominent, as if borne on tiny papillae. Anteriorly there are two pairs of oval glandular patches in setal line *b* on the hinder border of segments 7 and 8 projecting backwards so as to lie partly in the next segment, and an oval ventral median patch on the anterior border of each of segments 8 and 9.

Anatomy : Septa 7/8–12/13 are slightly thickened, the strongest being 9/10–11/12.

Gut : The gizzard, which is small and not very strong-walled lies in segment 5. The entire oesophagus has an extremely rich blood supply, and in segment 16 it is swollen, rounded, somewhat paler, and very smooth. Since there was only one specimen upon which to work this swelling was not sectioned, but its structure is probably that of a calciferous gland though its outer walls are much smoother than is usual with the calciferous glands of other species of the genus. The mid-gut begins in segment 18.

The last heart is in segment 13.

Meganephridia are present, occurring first in segment 13.

Neither testes nor spermiducal funnels were seen but there are probably two pairs in segments 10 and 11 since both of these segments contained free sperm masses. There is one pair of sperm sacs projecting from septum 11/12 into segment 12. These sacs are broken up so as to appear like a mass of

small sacs closely pressed together. The spermiducal glands are long and cylindrical and occupy segment 18 with one loop projecting forwards into segment 17. The muscular duct is much narrower and moderately long. Penial setae are present. The sac containing them was removed from one side of segment 18 where it opens side by side with the duct of the spermiducal gland. The sac itself was very long and thread-like and in it were three slender, delicate and apparently fairly pliable penial setae. These setae are evenly curved and have a slight bend at the extreme distal point. The distal third is beset with small spines arranged in rows encircling the setae and becoming scantier and more scar-like proximally. Two of the setae project from the sac, and these two measure 2·5 and 2·6 mms. respectively, being proximally ·03 and distally ·01mm. in diameter. One of these has a slight nodulus at a point about two-fifths of its length measured from the proximal end and this same seta has a somewhat undulating surface towards its base. The other has no nodulus but there is a slight swelling about half way along it. The third seta is not so well developed and lies further back in the sac. It is shorter, being only 2·2 mms. in length, the spines are little more than small scars and a faintly striated core is visible. Like one of the other two setae the wall of the base is undulating but the undulations are longer and extend further along it.

The female organs are normal in position, the ovaries being large and rather bushy.

The spermathscae are extremely large and sac-like with a short indistinctly defined duct and a large, also sac-like diverticulum which is about three-quarters as long as the main body of the spermatheca.

Locality : Roleystone.

Remarks : Only one specimen of this species was found and that was examined by dissection. It appears to be a normal Plutellus except that the last heart lies in segment 13. The position of the last heart is not a generic character, but in most species, certainly in all of those recorded previously from West Australia, it is in segment 12.

14. **Plutellus varicystis.** Sp. nov.

Pl. XV. Fig. 4. Text-figs. 7, 8.

External features : Length, 63 mms., diameter, 2·5 mms. These measurements were taken after the specimens had been preserved in alcohol. There are, roughly, 120 segments in the body.

The worms were not seen alive, but after preservation they were flesh-coloured, some with a brownish tinge.

The head is epilobous.

The setae are rather stout and fairly evenly arranged, *d* being slightly dorsi-lateral. There are no penial setae, the two ventral pairs being missing entirely from segment 18.

The clitellum is saddle-shaped, covering segments 14–17. It is inconspicuous, and only occurred on a very few of the specimens obtained.

Dorsal pores occur from furrow 5/6 onwards, but are lacking in the clitellar region, that is, from (14/15?), 15/16, and 16/17. These pores were lacking even in the individuals in which no clitellum could be distinguished.

No pores are visible on the ventral surface, even with the aid of a lens. Segment 18 is marked ventrally by a pale oval patch which extends laterally to the *b* line of setae on each side ; as noted above, there are no ventral setae

on this segment. It is difficult, even by examining serial sections, to determine the exact position of the male pore. The duct of the spermiducal gland enters the body wall in line with the *b* setae, but then appears to curve in a ventral direction, opening somewhat medial to this line.

Accessory glands occur in the form of small rounded papillae, one pair just medial to the *b* line of setae between segments 11 and 12, and another pair in the same position between segments 16 and 17. A median unpaired papilla also occurs in furrow 16/17.

Serial sections also show that the spermathecal pores lie in the *a* line of setae in furrows 7/8 and 8/9.

Anatomy : Septa 6/7–11/12 are slightly thickened.

The gizzard, which is large and well formed, is in segment 6. The oesophagus has no lateral calciferous glands, but vascular folds of the wall project into the lumen in the manner usually associated with these glands.

The last heart is in segment 12.

The male genital organs consist of two pairs of testes and seminal funnels projecting freely into the body cavity in segments 10 and 11 ; two pairs of sperm sacs projecting from septa 9/10 and 11/12 into segments 9 and 12 ; and a closely coiled tubular spermiducal gland with an extremely short muscular duct.

There are two pairs of spermathecae which seem to show a good deal of variation in structure. The main pouch is ampulla-shaped but it may be slender or stout, and bears, usually, two slender diverticula, each with a terminal chamber. Often, however, only one diverticulum is present, or so many as three may occur. The number of these diverticula appear to differ even in spermathecae of the same individual.

Locality : The Porongorups.

2. Genus PONTODRILUS, E. Perr.

8 setae per segment. Male pores paired. Spermathecal pores, 2 or 4 pairs, the last in furrow 8/9. Gizzard rudimentary. Always meganephridial. Spermiducal glands tubular with a simple unbranched canal.

On the ocean shore. Southern France, Bermudas, Florida, West Indies, Brazil, West Mexico, lower California, Hawaii, Japan, Chatham Is., Loyalty Is., Celebes, Aru Is., Christmas Is., India, Ceylon, South-West Australia.

Pondodrilus albanyensis, Michlsn.

Colour, yellowish-gray and unpigmented. Head epilobous. Setae not distinctly ornamented, apparently without ornamentation : $aa = 2ab$, $ab = \frac{2}{3}\ bc$, $bc = \frac{5}{3}\ cd$, $cd = \frac{2}{3}\ dd$. Dorsal pores lacking. Male pores in segment 18 on small medially-inclined papillae in the *b* line of setae ; spermathecal pores 2 pairs in furrows 7/8 and 8/9, also in the *b* line. Accessory glands consist of 1 pair of small oval papillae between the setal lines *a* and *b* in furrow 18/19, and 2 unpaired ventral-median spindle-shaped papillae in furrows 17/18 and 18/19. Septa 5/6–13/14 thickened. Gizzard rudimentary in segment 5. 2 pairs of testes in segments 10 and 11 ; 2 pairs of racemose sperm sacs in segments 11 and 12 ; spermiducal gland closely coiled with a short narrow twisted duct. Penial setae do not occur. Spermathecae with an irregular sac-like ampulla merging into the duct ; a tubular diverticulum opens into the duct.

Locality : Albany, Nornalup, and Herring Bay.

Pontodrilus albanyensis, Michlsn var. **cygni** var. nov.

Plate XIV., Figs. 2, 3, 4, 9.

1907. *Pontodrilus albanyensis*, Michaelsen : *Die Fauna Sudwest Australiens* Band I., Lieferung 2. p. 185. Pl. II., Fig. 26.

External features : Length, 140 mms. ; diameter, 3 mms.

The worm is colourless, but with a red tint due to the blood in the vessels being visible through the skin.

The head is slightly epilobous.

The setae are ornamented, but the ornamentation, which consists of rows of very numerous and very fine teeth, could only be distinguished with the oil immersion lens. The setal distance *ab* is less than *cd*, and *d* is dorso-lateral, almost dorsal in position. There is no clitellum, but after preservation the more mature specimens show a slight constriction covering segments 13–18.

The male pores are in segments 18 in papillae which lie in the *b* line of setae. The spermathecal pores are also in line *b* between segments 7–8 and 8–9.

The accessory glands consist of a pair of tiny papillae lying in furrow 18/19 sometimes appearing to be on the posterior margin of 18, between the *a* and *b* setae on each side, and four transversely oval papillae in the ventral-median line in furrows 17/18, 18/19, 19/20, and 20/21.

Anatomy : Septum 13/14 is the last to show any traces of thickening.

A rudimentary gizzard occurs.

The nephridia, are large and distinct and may be seen clearly through the body-wall. They first occur in segment 15, though a small, feebly developed pair may occur in segment 13.

The male genitalia consists of two pairs of somewhat filamentous testes, their corresponding funnels projecting into the body-cavity in segments 10 and 11. Racemose sperm-sacs project from septa 10/11 and 11/12 into segments 11 and 12. There are also two tiny fan-like projections of the anterior septum into segment 14, which are suggestive of rudimentary sperm sacs. The spermiducal glands which occupy segments 18 and 19, are tubular and tightly coiled, with a muscular duct which is equal in diameter to the glandular region, but is distinct because almost straight.

The spermathecae consist of an elongated ovoid sac merging into a duct from the proximal end of which a tubular diverticulum, about half as long as the sac, is given off.

Locality : The bank of the Swan River, at Claremont. May, '27.

Remarks : Numerous specimens were obtained by digging in the sandy bank to a depth of 6–12 inches, when water was reached. This water was fresh, but the worms, like the majority of the Pontodrilids, seem quite able to stand the salt water of the river itself.

These specimens closely resemble *P. albanyensis*, differing only in size and the presence of two extra papillae on the ventral surface. The shape of the spermatheca is rather more regular, and the spermiducal gland more tightly coiled.

On two other occasions specimens of this variety have been collected. In November, 1925, a number were taken at Nornalup Inlet, in brackish water at the outlet of a spring, but the worms when examined later were found to be so badly preserved that very few features could be determined with accuracy. There was, however, a clitellum covering segments 14 to 18. In May, 1927, further specimens were obtained from the same locality. These all proved to be immature and lacked clitella, but they agreed in the type of spermathecae with the badly preserved specimens previously collected. In life their colour was similar, but in alcohol they differed slightly, being flesh-

coloured as against a dirty yellow, but all caused the same yellow discolouration of the preserving fluid. The immature individuals appeared to agree with *P. albanyensis* var. *cygni* described above, though in no case were all four accessory glands developed. In the majority they were lacking entirely, but that in furrow 17/18 was present in a few cases appearing more often to occupy the anterior midventral margin of segment 18, and in one specimen the lateral papillae between *a* and *b* in 18/19 and the mid-ventral papillae in 18/19 and 19/20 were also present. This same individual showed a narrow transverse ridge across the ventral surface of segment 14. The only other difference lay in the head, the epilobous condition being much more distinct than in var *cygni*, and in the nephridia which were small but quite well developed in segment 13.

If the specimens first collected are of the same species as the others, as appears to be the case, it would seem to indicate that the clitellum is only developed during certain months, for it is entirely lacking in the specimens obtained from the Swan River in May, '27, which specimens are in all other respects apparently mature. It is probable also that the glandular region of the spermiducal gland become more swollen, and so more distinct during these months.

In Plate XIV. drawings of the spermatheca and spermiducal gland of *P. albanyensis* Mchlsn. are included for the sake of comparison.

Pontodrilus bermudensis, Bedd. forma *ephippiger*, Rosa.

Colour, deep yellow, Setae : *aa* = 2*ab*, *ab* = *bc* = *cd* (approx.), *dd* = 3 *cd* ; *bc* becomes larger anteriorly. Clitellum saddle-shaped covering segments 13–17. Male pores in the *b* line of setae in segment 18, on the medial side of lateral swellings and at each end of a ventral median groove ; a transverse ventral median sucker-like groove occurs in furrow 19/20. Spermathecal pores in the *b* line of setae. Septa 9/10–12/13 thickened. Gizzard unknown. Two pairs of testes and seminal funnels ; 2 pairs of sperm sacs in segments 11 and 12 ; spermiducal gland with a distinct forwardly-curving duct and a twisted glandular region. Spermathecae with a slender tubular diverticulum that may be longer than the ampulla.

Length 43–47 mms. ; diameter 3 mms. ; number of segments 85–100.

Locality : Cottesloe and Denham.

Distribution : Christmas Island, Celebes (Pare-Pare), Hawaii (Laysan).

Remarks : This species was recorded from Denham in 1905 by Michaelsen, but he made no further remarks concerning it. It may, therefore, be concluded that the specimens collected agreed with his original description of the species as given above. Five specimens, only two of which were mature, have since been found entangled in balls of weed at the water's edge at Leighton and Cottesloe, and these differ in one or two characters : in neither of the two apparently mature specimens was there a clitellum developed ; both had a second pair of papillae on segment 18, medial to the lateral longitudinal walls (in one case these papillae were large and merged into the lateral walls, giving the effect of one large cleft papilla on each side ; in the other case they were small, the condition thus being similar to that in the same species as described by Stephenson from Chilka Lake) ; the transversely oval papilla between segments 19–20 was only faintly developed ; and there was in one case a thickened ridge along the anterior ventral margin of segment 14. The spermathecae were similar to those in the specimen from Chilka Lake, described by Stephenson (1914) having a diverticulum opening not to the duct but to the external surface close to the opening of the main pouch.

The chief difference lies perhaps in the fact that the setae are ornamented, but the ornamentation is slight and not constant. Smooth simple

setae are to be found as well as notched forms, such as are figured on Plate XIV., Fig. 6.

The largest specimen measured 85 mms. in length, with a diameter of 2 mms., and showed 97 segments.

Discussion on the genus PONTODRILUS, E. Perrier.

The following definition of the genus is given by Michaelsen in *Das Tierreich* 10 Lieferung, page 179 :—

"Borsten zu 8 an einem Segm. Gurtel mit oder vor dem 14 Segm. beginnend, uber 5/6 Segm., 1 Paar weibliche Poren ; 2 Paar Samentaschenporen auf Intsegmtf. 7/8 and 8/9. 1 rudimentarer Muskelmagen vor den Hoden-segm., oder kein Muskelmagen. Meganephridisch ; Nephridien vor der Gurtelregion fehlend. 2 Paar freie Hoden und Samentrichter ; 2 Paar Samensacke im 11 und 12 Segm. ; Prostaten Schlauchformig ; die Samenleiter munden in den Ausfuhrungsgang oder in den Drusenteil der Prostaten ein."

This definition must be modified slightly in order to include a species which has been described since the publication of *Das Tierreich*. *P. agnesae* Stephenson, which has been recorded from India and Ceylon, has two pairs of sperm sacs projecting from septa 9/10 and 11/12 into segments 9 and 12.

A revised definition might read :—8 setae per segment ; clitellum begins with or before segment 14 and covers 5–6 segs. ; 1 pair of female pores ; 2 pairs of spermathecal pores in furrows 7/8 and 8/9 ; gizzard rudimentary, occurring before the segments containing the testes, or lacking ; meganephridial ; nephridia lacking in the anteclitellar region ; 2 pairs of testes and funnels projecting into the body cavity ; 2 pairs of sperm sacs ; spermiducal gland ampulla-shaped ; vas deferens open into the duct or into the glandular region of the spermiducal gland.

Twelve different species and two varieties have at various times been assigned to the genus *Pontodrilus*, but marked similarities have led eventually to a recognition of the identity of some of them.

From the study of a table compiled from the descriptions (specimens being available in three cases only) of these thirteen species it would seem that the genus as it now stands includes a number of forms regarded as specifically distinct, but which are so closely related as to warrant a further reduction in their number.

Identification has been based on various characters some of which on investigation show an inconstancy that deprives them of importance.

For example :—

(1) The setal distances. In this case allowance must be made for inequalities in shrinkage during fixation. The formulae, unless very distinctive, are, therefore, scarcely of diagnostic value.

(2) The occurrence of thickened septa. Stress has often been laid upon this character, but it is now generally agreed that the importance of the extent of these septa is subordinate to other features.

(3) Glandular markings. These are certainly different in each species as originally described, but they also appear to vary in individuals. Several cases of this inconstancy in individual members of a species may be mentioned

(a) Stephenson (1914), in his remarks on *ephippiger* Rosa as found at Chilka Lake, states :—"The genital markings are variable. (1) Most constant is one in 19/20, of an oval shape with long axis transverse ; its extent varies between setae *a* and *a*, or between *b* and *b* ; the form it takes also varies :—(a) It may be a depression, with a well-marked lip-like margin,

and thus somewhat sucker-like ; (b) or a broad white low papilla with a flat surface ; (c) or a whitish well-defined area, but not raised above the general surface ; or (d) it may be very inconspicuous, though never, so far as I observed, entirely absent.

" The next commonest genital mark is (ii) a similar oval area in furrow 12/13, of whitish colour, stretching from between lines *a* and *b* on one side to a corresponding point on the other. This has the form of a low flat papilla ; it was present, though not always equally well-marked in about half the specimens examined. (iii) In one case there was a slight whitish, ill-defined elevation in the situation of groove 13/14."

Stephenson's specimens of *P. bermudensis* Bedd var. *ephippiger* Rosa differ from those found by Rosa in the presence of papillae on 12/13 and 13/14 and in the nature of the marking on 19/20. They also differ slightly in the setal distance *dd* and in the shape of the spermatheca.

This species as found at Cottesloe also varies ; one individual showed a thickening of the anterior ventral margin of segment 14 which was lacking in the other. In neither individual was there a papilla in 12/13.

(b) Beddard (1903) makes similar remarks concerning *P. laccadivensis*. He says : " I have studied 13 fully mature examples of this species, all of which show some of the ante-clitellar papillae which distinguish this species from all other *Pontodrilus* except Michaelsen's variety.* These papillae are not, however, equally or similarly developed in all. In seven examples there are two papillae plainly visible ; one lies between segments XII/XIII, and is, as a rule, much more conspicuous by reason of its convexity than the second papilla, which is *not* intersegmental in its position. It lies on XIV, though near to the anterior margin of that segment and not between XIII/XIV. In six individuals one or the other of these papillae was missing. In the last individual the two papillae were between XI/XII and XII/XIII, and both were of the same character. I may observe that the papilla upon segment XIV and that upon segments XII/XII occasionally showed considerable traces of being double. In no individual did I find a papilla between XIV/XV such as is mentioned by Michaelsen in his description of *P. Matsushimensis* var *chathamiana*. In addition to these there are, as Michaelsen has pointed out, others situated more anteriorly still."

(c) *P. albanensis*, Michaelsen may serve as a third example. This was described by Michaelsen (1905) as having one small oval papilla in furrow 18/19 between setae *a* and *b*, and two unpaired ventral-median papillae in furrows 17/18 and 18/19. Numerous specimens of this species were collected by the writer at Nornalup Inlet, on the South-West corner of Western Australia, and it was found that though the marking was fairly constant in mature specimens, it was often very indistinct, and in several cases one or other of the papillae was missing. A small additional papilla occurred in furrow 19/20 of one specimen.

(d) Similarly with the new variety *cygni* there are usually four, but occasionally only three unpaired ventral-median papillae. An examination of specimens obtained later from Nornalup showed that 1, 2, 3, or 4 papillae may occur. As most of these specimens were young it would seem that immaturity may account for this apparent variation, the papillae developing not all at once but in turn, that in 17/18 appearing first. Two specimens however showed a transverse thickening on the ventral surface of segment 14, which was lacking in all the others.

Stephenson (1914) makes similar comments on the subject. He remarks on the variability of the species and adds *ephippiger* Rosa and

* *P. matsushimensis* Iizuka, var. *chathamiana*, Michlsn.

laccadivensis Bedd. to the three species already recognised as identical by Michaelsen, *i.e.*, *bermudensis* Bedd., *insularis* Rosa, and *arenae*, Michaelsen. He also puts forward as a debatable matter the importance of the muscular duct of the spermiducal gland. This duct is distinct in every species with the exception of *matsushimensis* Iizuka and *agnesae* Stephenson. In *matsushimensis*, however, the male genital area in segment 18 is of the typical *ephippiger* type, which fact casts some doubt on the importance of the condition of the duct, especially when consideration is given to the fact that in one case at least (*P. albanyensis* var. *cygni* var. nov.) the duct is equal in diameter to the glandular region and distinguishable only by virtue of being nearly straight. It must be admitted that this may be due to slight immaturity, since specimens of *P. albanyensis* Michaelsen have been examined in which these two diameters were equal, while in others the glandular region was considerably swollen.

In the following table species with a similar male genital area have been placed together. The data was obtained in the cases of *insularis* Rosa, *arenae* Michlsn., *matsushimensis* Iizuka, *ephippiger* Rosa, *litoralis* Grube, *michaelseni* Eisen, and *hesperidum* Beddard from Michaelsen's " Das Tierreich " Lief 10 ; the rest was taken from the original descriptions, with an addition in the case of *albanysensis* Michlsn. concerning the position of the first nephridia, which was noted from specimens dissected by the writer.

This arrangement adds *matsushimensis* Iizuka to the group compiled by Stephenson. and this perhaps is to be desired since its resemblance to *laccadivensis* Bedd. has been commented on by Beddard (1903). This species stands rather apart, however, from the rest, being the only species lacking a distinct duct to the spermiducal gland, also the only species in which the clitellum completely encircles the body.

The advantage of setting out the original descriptions of species now recognised as identical lies in the fact that it shows that the distinction between other species is equally fine. They are all strikingly similar except in the male genital area, and even here the lateral walls of the group mentioned above, the medially-inclined papillae of *albanyensis* Michaelsen, the erect papillae of *albanyensis* Michlsn. var *cygni* var. nov., the absence of papillae in *hesperidum* Beddard, and the depressed areas in *crosslandi* Beddard seem to form a connected series ; and the second pair of papillae of *bermudensis* Beddard, forma *ephippiger* Rosa as found at Chilka Lake and Cottesloe suggests a link between that species and *michaelseni* Eisen.

This arrangement is also suggested by the position of the first nephridia, which occur, usually though not always, in segment 13 in the *bermudensis* groups and in *michaelseni*—which fact again suggests a connection between these two species ; are reduced in size in segment 13 and missing in segment 14 in *albanyensis* ; and lie in segment 15 in *crosslandi*.

The two species *litoralis* Grube and *agnesae* Stephenson are distinct, the former in that the pores are all in the *a* line of setae, the latter in that the sperm sacs are in segments 9 and 12. With these two exceptions there is a remarkable similarity between all the species of *Pontodrilus* which makes identification somewhat difficult.

In view of the lack of actual specimens of all but a few species, this discussion of the genus cannot lead to any definite statement, but it may serve to show that when a revision of the genus *Pontodrilus* is undertaken the chief point for consideration must be whether species are to be established on an aggregation of minor points, or whether the example of Michaelson and Stephenson is to be followed, species hitherto considered distinct being recognised as local varieties of a few very widespread and very variable species.

Pontodrilus.	Colour.	Head.	Setae.	Spermathecal Pores. Line of Setae.	Spermathecae.	Thickened Septa.	Gizzard.	Sperm Sacs. Segments.	Male Pores. Segment 18.	Accessory Glands.	First Nephridia. Segment.	Duct of Spermiducal Gland.	Clitellum. Segments.	Dimensions. mms.	Number of Segments.	Distribution.
bermudensis	...	...	Slightly ornamented	*b* on conical papillae	... ...	...	Rudimentary	...	... ...	Raised oval area in anterior-ventral region of seg. 14. Unpaired ventral-median papillae in furrows 12/13 and 19/20	...	Distinct	...	L 32—65 D 2—2½ (India) L 100—120 D 3—3½ (Burma)	100—120	Bermuda, Bahamas, India, Burma.
insularis	Brown	Prostomium without a dorsal extension	Ornamented: $ab < bc < cd$; $dd \leqq 2cd$; $aa = 2\ ab$	*b*	Ampulla-shaped without a diverticulum	6/7—12/13	Rudimentary in seg. 7	11 and 12	On medial margin of longitudinal walls between *b* and *c*. A median pit extends between these walls.	... ...	13	Distinct	...	L 50 D 3	100 (ca.)	Aru Is., Ceylon.
arenae	Clear grey with a faint violet tone	Epilobous ½	Ornamented: $aa > ab < bc < cd$; In clitellar region: $aa = ab$, $bc = cd$; Anteriorly: $dd = 3\ aa$; Posteriorly: $dd = 1\frac{1}{2}\ aa$	*b*	Slender ampulla-shaped diverticulum opening into the distal end of the long thin duct	4/5—10/11	Rudimentary	11 and 12	In line *b*, on the medial side of strongly pronounced longitudinal pads	Unpaired ventral-median papilla in furrow 19/20	13—15	Distinct	13—17	L 80 D 3	120	Brazil, Florida ?, Jamaica ?, Bermuda ?
ephippiger	Deep yellow	Slightly epilobous	Behind the clitellum: $aa = 2\ ab$; $ab = bc = cd$ (almost); $ab < bc < cd$; $dd = 3\ cd$; *bc* greater anteriorly	*b* on small papillae	A slender ampulla-shaped diverticulum longer than the main pouch	9/10—12/13	Lacking	11 and 12	In line *b*, on the medial side of lateral swellings. A ventral-median groove.	Unpaired ventral-median papilla in furrow 19/20	...	Distinct	13—17 Saddle-shaped	L 43—47 D 3	85—100	Christmas Is., Hawaii, Celebes, California.
ephippiger	Light grey, or olive green with a reddish clitellum	Epilobous	Unornamented: $ab = \frac{3}{4}\ aa = \frac{3}{4}\ bc = \frac{3}{4}\ cd$ Behind the clitellum: $ab = \frac{1}{2}\ aa$; $aa \leqq bc = cd$; $dd = 2\ cd$	*b* on papilae	Duct nearly as long as the elongated ovoid sac. Tubular diverticulum with an independent opening to exterior.	5/6—12/13	Lacking	11 and 12	In line *b* on small papillae lying on the inner side of a groove medial to pronounced longitudinal walls	Variable. Most constant; papilla in 19/20. Often a papilla in 12/13, rarely in 13/14.	1 or a pair in 13 Lacking in 14	Distinct	½ 13—17 Saddle-shaped	L 32—65 D 2—2½	106—108	India (Chilka Lake).
ephippiger	Creamy-white with a reddish tone	Slightly epilobous	Sometimes slightly ornamented: $ab < cd$	*b*	Diverticulum longer than main pouch, and opening individually to the exterior	5/6—12/13	Lacking	11 and 12	The longitudinal walls extend slightly towards the mid-ventral line along 17/18 and 18/19. A pair of small papillae between *a* and *b*.	Variable. Ventral-median papilla in 19/20. A thickening of the anterior-ventral margin of 14 may occur.	13	Distinct	Lacking	L 85 D 2	97	Western Australia (Leighton and Cottesloe).
laccadivensis	...	Slightly epilobous	... ...	*b* at each end of a dumb-bell shaped thickening	Sac-like, with a tubular diverticulum as long as the main pouch. A distinct duct.	6/7—12/13	Feeble, in seg. 7	11 and 12	As in *Pontodrilus matsushimensis*	Ventral-median papilla in 19/20. Anteclitellan papillae somewhat similar to those in *P. matsushimensis* var. *chathamiana*, but variable.	13	Distinct	13—17 Saddle-shaped	L 90—110	...	Maldive and Laccadive Is.
matsushimensis ...	White with a light red tone	Epilobous ⅔	Short and simple: $ab < cd$ ...	*b*	With a diverticulum	5/6—12/13	Rudimentary	11 and 12	In a rectangular glandular field with swollen lateral margins overhanging the pores	Ventral-median papilla in 19/20	13	Indistinct	12 or 13—17 Complete	L 90—110 D 3—3½	100—105	Japan, New Caledonia, Isle of Pines.
matsushimensis var. *chathamiana*	...	Prolobous	... ...	...	Diverticulum truncate	...	...	...	... ...	Ventral-median papillae in 11/12, 12/13, 14/15, 19/20. Ventral surface of segs. ½ 7 —½ 9 glandular.	...	Indistinct	Lacking (immature ?)	D 3½	...	Chatham Is.
michaelseni	Faded flesh-colour	Epilobous ½	Smooth: $cd > ab$ (slightly); $aa > bc$ (slightly); $aa = 2\ ab$	*b* at each end of a biscuit-like papilla	Cylindrical with an ampulla-shaped diverticulum 2/3 as long as the main pouch	4/5—12/13	Rudimentary	11 and 12	In line *b* between 2 pairs of papillae. 1 medial, 1 lateral to pores	... ...	13	Distinct	13—17 Saddle-shaped	L 83 D 3	...	Mexico.
albanyensis	Yellowish-grey	Epilobous ⅔ (ca.)	Not distinctly ornamented: $aa = 2\ ab$; $ab = \frac{1}{2}\ bc$; $bc = \frac{3}{4}\ cd$; $cd = \frac{3}{4}\ dd$	*b*	Sac-like, the duct half as long as the main pouch, but not sharply defined. Diverticulum half as long as main pouch.	5/6—13/14	Rudimentary in seg. 5	11 and 12	In line *b* on small medially bending papillae	Two unpaired ventral-median papillae in 17/18 and 18/19. Small pair papillae between *a* and *b* in 18/19.	13 Lacking in 14	Distinct	Lacking	L 50 D 2	86	Western Australia (Albany).
albanyensis var. *cygni*	Colourless with a red tone	Slightly epilobous	Ornamented: $ab < cd$; *d* dorsolateral	...	Elongated ovoid sac merging into duct. Cylindrical diverticulum half as long as the main pouch.	6/7—12/13	Rudimentary	11 and 12	In line *b* on papillae	Pair of small papillae between *a* and *b* in 18/19. Unpaired papillae in 17/18, 18/19, 19/20, 20/21.	13 Lacking in 14	Distinct	Lacking	L 140 D 3	90 (ca.)	Western Australia (Swan River).
hesperidum	...	...	Unornamented and wide-set ...	...	With a cylindrical diverticulum ...	5/6—12/13	Lacking	11 and 12	In place of the *b* setae	... ...	...	...	...	L 25 D 1½	...	Jamaica.
crosslandi	...	Epilobous ½—½	$ab < cd$	*a*	Diverticulum half as long as the main pouch	—13/14	Not prominent	11 and 12	In line *b*, each opening to a depressed area divided by a transverse fold	Paired kidney-shaped papillae in line *a* at furrows 13/14 and 14/15	15	Distinct	13—18	L 100	...	Shores of the Red Sea.
agnesae	Dark brown	Prolobous almost zygolobous	$aa = 2\ ab$; $bc = 1\frac{1}{2}\ ab = cd$; $dd = 3\ cd$ (ca.) = ½ circumference; *a* and *b* missing from seg. 18	*b*	Sub-spherical, with a stout duct not sharply defined. Diverticulum club-shaped = half main pouch.	7/8—12/13	Lacking	9 and 12	Between *a* and *b* on small papillae	Lacking	13 (12 ?)	Indistinct	½ 13—½ 17 or 17 Ventrally in the form of a groove.	L 65 D 1	116	India, Ceylon.
litoralis	...	Epilobous ½	Smooth and simple: $aa = bc = cd$; $ab = \frac{2}{3}\ aa$; $dd = 2\ aa$	*a*	Pear-shaped, with a small pear-shaped diverticulum	...	Lacking	11 and 12	In line *a*	Unpaired ventral-median papillae in 19/20 and 20/21	15	Distinct	13—17 Complete	L 100 D 4	...	Southern France.

3. Genus MEGASCOLIDES McCoy.

Eight setae per segment. Spermathecal pores, 2–5 pairs, the last in furrow 8/9. 1 gizzard in segment 5 or 6, or in 5 and 6. Micronephridial in the anterior region of the body. Spermiducal glands tubular with a simple unbranched canal.

Australia, Tasmania, New Zealand (North Isl.), and west of North America.

Megascolides nokanenaensis, Michlsn.

Colour, a dirty yellow-gray with a trace of red-brown pigmentation encircling the head end. Setae : $aa = bc$, $ab < bc < cd < \frac{1}{2}\ dd$; $dd = \frac{1}{3}\ vv$; Posteriorly *ab* becomes approximately equal to *aa* and the lines *c* and *d* become irregular. First dorsal pore in furrow 6/7. Clitellum covers segments $\frac{1}{4}13$–$\frac{1}{2}18$ and is complete but not so well developed ventrally in segments 14–16. Male pores on tiny whitish papillae in the *a* line of setae in segment 18 ; 4 pairs of spermathecal pores also in line *a* in furrows 5/6–8/9. Accessory glands consist of one pair of indistinctly defined oval papillae in segment 17 between the lines *a* and *b*. Septa slightly thickened in the anterior male genital region. Gizzard in segment 6 (?) ; oesophagus with a folded vascular wall, without calciferous glands. Mid-gut without a typhlosole. Excretory system for the most part micronephridial ; in the posterior segments the micronephridia blend to form one meganephridium on each side in each segment. 2 pairs of testes and funnels in segments 10 and 11 ; spermiducal glands tubular and thick-walled, with a narrow lumen ; the glandular region is coiled, the loops being so closely pressed as to make the structure appear to be of the compact Pheretima type. Penial setae delicate and curved, the distal region irregularly bent ; the extreme distal end is flattened and diverges into 2 slender, slightly curved teeth ; distally, with the exception of this flattened region, each seta is beset with scattered scars which resemble small teeth lying flat against the seta. Spermathecae consist of a sac-like ampulla and a sharply defined duct which is almost as long as the ampulla ; a simple pear-shaped diverticulum opens into the duct just above its distal end.

Length : 32 mms. ; diameter 2 mms. ; number of segments 84.

Locality : Northampton.

4. Genus WOODWARDIELLA, Stephenson.

Syn. *Woodwardiella* Stephenson. P.Z.S. 1925, p. 888.

Woodwardia Michlsn. 1907 Fauna S.W. Austr. I. p. 161. nec Crosse & Fisher 1861 (Mullusca)....

Eight setae per segment. 1 gizzard in segment 5 (or a neighbouring segment ?). Always meganephridial. Spermiducal gland with a branching canal-system in the glandular region.

Australia, Tasmania, and Celon.

KEY TO SPECIES OF WOODWARDIELLA.

1.	Male pore in the *a* line of setae—2.	
	Male pore between the *a* and *b* lines of setae—3.	
2.	Male pores in a depressed oval area	5. *W. magna.*
	Male pores on small papillae	2. *W. affinis.*
3.	Thickened ridges occur posterior to the male pore	1. *W. callichaeta*
	Thickened ridges do not occur posterior to the male pore—4 .	
4.	Penial setae with a simple distal tip	4. *W. molaeleonis.*
	Penial setae with a flattened spade-like tip	3. *W. lipferti.*

1. *Woodwardiella callichaeta*, Michlsn.

Colour, a dirty gray, the head-end being clearer. Head epilobous. Setae wide apart : $aa = bc = \frac{1}{2}dd$, $ab = \frac{}{5}\ aa$, $cd = \frac{4}{5}\ aa$; posteriorly

cd = *bc* (approx.). Dorsal pores only known posterior to the clitellum. Clitellum complete, covering segments 14–17. Male pores on small oval papillae in segment 18, between the *a* and *b* lines of setae. Spermathecal pores, 2 pairs in the *a* line of setae in furrows 7/8 and 8/9. Accessory glands consist of narrow elongated pads in either of furrows 19/20 and 20/21, or in both ; in one specimen these pads occurred in 11/12 and 19/20. Septa 9/10 and 10/11 slightly thickened, those immediately before and after gradually becoming more delicate. Gizzard large in segment 5 ; oesophagus with a vascular wall thrown into folds internally, without calciferous glands, but with a pair of short stout sacculations in segment 13 (?). Last heart in segment 12. 2 pairs of testes and funnels in segments 10 and 11 ; 2 pairs simple sperm sacs in segments 9 and 12, the posterior pair large, the anterior small. Spermiducal glands loosely racemose with a slightly curved duct equal in length to the glandular region. This duct is unusual in having a branching lumen, the branches proximally directed. Penial setae flattened distally ending in 2 small prongs which give the apical margin a concave curve ; the distal portion is beset with slender, moderately long sloping teeth arranged in 3 fairly regular longitudinal rows. The spermathecae consist of a long ampulla divided into 2 regions ; the proximal region is smooth thin-walled and sac-like, and filled with a granular mass ; the distal region is neck-like and thicker walled, and merges into a short duct ; a long cylindrical diverticulum opens into the distal end of the neck-like region.

Length : 50 mms. ; diameter $2\frac{2}{3}$ mms. ; number of segments about 140.

Locality : Jarrahdale.

2. *Woodwardiella affinis*, Michlsn.

Colour, dirty gray. Head tanylobous. Setae : *aa* = 2*ab* = $1\frac{1}{2}$*bc* ; *bc* = *cd* ; *dd* = $\frac{1}{4}u$ anteriorly, but = $\frac{1}{6}$ *u* posteriorly. First dorsal pore in furrow 6/7 or further forward. Clitellum complete covering segments 14–17. Male pores on small papillae in segment 18 in the *a* line of setae ; spermathecal pores, 2 pairs, in furrows 7/8 and 8/9 immediately lateral to the *a* line of setae. Accessory glands consist of oval glandular areas extending to the *a* line on each side in furrow 11/12 and in segments 19 and 20, the last 2 not so distinct and the last one slightly smaller. Septa 6/7–15/16 very slightly thickened. Gizzard in segment 5 ; oesophagus without calciferous glands but in the hinder region the wall is vascular and thrown into longitudinal folds internally, and in segment 16 there is a large dilatation. Last heart in segment 12 ; 2 pairs of testes and seminal funnels in segments 10 and 11 ; 2 pairs of large irregular sperm sacs in segments 9 and 12 ; free seminal masses in segments 10 and 11. Spermiducal glands short, broad and deeply-lobed, with a distinct irregularly bent duct. Penial setae curved, the curve being more acute distally ; the extreme distal end is flattened at right-angles to the plane of the curve or terminates in a flat plate which widens distally, the distal margin being concave ; this flattened plate is bent back to form an angle with the convex side of the seta ; the distal region of the seta, with the exception of this plate, is beset with large scattered teeth. Spermathecae elongated and sac-like, merging into a narrow duct ; an ampulla-shaped diverticulum opens into the narrow distal region of the ampulla.

Length : 22–32 mms. ; diameter 1–$1\frac{1}{3}$ mms. ; number of segments, 85–103.

Locality : Jarrahdale.

3. *Woodwardiella lipferti*, Michlsn.

Colour, gray with a yellowish clitellum. Setae : $aa = 2ab = bc = \frac{1}{9}^{0}\ cd$; $dd = aa < \frac{1}{7}\ u$. First dorsal pore in furrow 5/6. Clitellum complete, covering segments 14–17. Male pores on oval papillae in segment 18, between the *a* and *b* lines of setae. Spermathecal pores, 2 pairs, in furrows 7/8 and 8/9, just above line *a*. Accessory glands represented by a single elongated ventral-median pad extending beyond the *a* line of setae on each side in furrow 11/12. Septa in the region of the testes slightly thickened. Gizzard large ; calciferous glands lacking. Spermiducal glands flattened, racemose, and closely pressed against the body-wall, with a short narrow duct. Penial setae simple and tapering, but curved distally. The extreme distal end is flattened, widened, and spade-like with a concave distal margin ; the convex side of the distal region, with the exception of the flattened portion, is marked by annular ribs, each bearing a row of small teeth. Spermathecae irregular and sac-like, sometimes with definite sacculations merging into a thick-walled duct ; a sausage-shaped diverticulum opens into the duct about half-way down its length.

Length : 40 mms. ; diameter $1\frac{2}{3}$ mms. ; number of segments, 106.

Locality : Subiaco.

4. Woodwardiella MOLAELEONIS, Michlsn.

Colour, yellow to gray, owing to the colour of the gut-contents. Head epilobous. Setae : $aa \geq bc \geq dd > cd > ab$. First dorsal pore in furrow 6/7 (further forward?) Clitellum complete, covering segments 14–17. Male pores on oval papillae in segment 18 between the *a* and *b* lines of setae. Spermathecal pores, 2 pairs, in furrows 7/8 and 8/9, just lateral to line *a*. Accessory glands represented by a single elongated pad extending nearly to line *b* on each side in furrow 10/11. Septa in the region of the male organs slightly thickened. Gizzard relatively large (in segment 5 or 6?) ; the hinder part of the oesophagus with a slightly folded inner surface ; Calciferous glands do not appear to occur. Last heart in segments 12. Meganephridia occur in the middle and hinder regions of the body, from segment 24 at least ; further forward they are apparently divided into a few irregular micronephridia, though this condition may be due to a breaking up during fixation. Testes and funnels, 2 pairs in segments 10 and 11 ; sperm sacs, 2 pairs in segments 9 and 12, the former simple the latter lobed though one lobe is always larger than the others. Spermiducal glands round the racemose, but closely pressed and flattened, with a short duct. Penial setae delicate, the distal end bent and tapering ; below the smooth tip each seta beset with teeth arranged in whorls of 2, 3, or 4. Spermathecae long and sac-like with a distinct duct about half as long as the ampulla ; a slender club-shaped diverticulum opens into the distal end of the ampulla.

Length, 20 mms. ; diameter, $1\frac{1}{3}$ mms. ; number of segments 84 or 89.

Locality : Lion Mill.

5. **Woodwardiella magna**, Sp. nov.

Pl. XV., Figs. 7, 10. Text-fig. 9.

External features : Length, 80 mms. in life ; diameter, 2–3 mms. ; number of segments 111.

The worm is colourless and at first glance appears to be devoid of external markings.

The head is tanylobous with a large and distinct prestomium.

The first dorsal pore occurs in furrow 3/4 in one specimen, and 5/6 in the other.

The clitellum is distinct and covers segments 14–18, though the intersegmental furrows are also clearly visible in this region, and in segment 18 the glandular thickening is apparently only lateral. The ventral region of these furrows is more deeply marked between segments 13 and 14, and again between 17 and 18.

The male pores are in segment 18 and lie in a depressed oval area. They are in the *a* line of setae and open immediately behind the conspicuous orifices of the penial setae.

There are two pairs of spermathecal pores lying in furrows 7/8 and 8/9 in the *a* line of setae on each side.

The accessory glands consist of an elongated oval slightly-raised area extending across the ventral surface of furrows 11/12 as far as the *a* line of setae on each side. One specimen was marked by a similar but smaller area on segment 19, while on the other there seemed to be a slight indication of a glandular area in furrow 22/23. None of the markings, with the exception of the oval area on segment 18 is at all distinct.

Anatomy : Septa 7/8–11/12 show a slight thickening, 8/9 and 9/10 being the strongest.

The gizzard is large and well-developed and lies in segment 5. The oesophagus has no lateral calciferous glands, but it is swollen in each segment and has a good blood supply. The mid-gut begins in segment 18.

The last heart lies in segment 12.

The excretory system is meganephric.

The male genital system consists of two pairs of sperm sacs projecting into segments 9 and 12, and two pairs of seminal funnels in segments 10 and 11. In one specimen only the sperm sacs of segment 12 were present. The testes were not seen, but free sperm masses filled the segments containing the funnels. The spermiducal glands are large and oval with an irregular margin, and a surface broken into numerous small areas which suggest lobes flattened and pressed together. The slender muscular duct opens approximately into the centre of the ventral surface of the glandular region.

The penial setae are curved and slender, tapering gradually from the stouter base. Apically they flatten in a plane at right angles to that of the curve, and end in a small fork. Of the five setae examined one was as described above, two were broken, the third was damaged and bent at the distal end and no fork was observed, and the last showed a forked tip that was slightly curved, there being a suggestion of a notch immediately behind the fork. They measure ·75–·85 mm. in length and with the exception of the flattened portion are marked distally by annulations bearing fine but irregular teeth.

The ovaries and oviducal funnels are normal in position. The external openings of the oviducts were not seen, but probably they lie far forward in segment 14, in the intersegmental groove of the clitellum mentioned above.

The spermathecae are large, irregular, and somewhat elongated, with a diverticulum which varies considerably in length opening into the proximal end of the duct.

Locality : Lesmurdie.

Remarks : Only two specimens were obtained but both of these were much larger than any of those of the same genus recorded by Michaelsen. They appear to come remarkably close to his *Woodwardia affinis*, differing chiefly in size, colour, and the condition of the area surrounding the male pores. Even the penial setae show a close resemblance, though they lack the tiny apical curve.

5. Genus NOTOSCOLEX Fletcher.

Eight setae per segment. Spermathecal pores 2 or 3 pairs, the last in furrow 8/9. 1 gizzard in segment 5 or 6. Micronephridial at least in the anterior region of the body. Spermiducal glands with a branching lumen.

Australia, Tasmania, and Ceylon.

KEY TO SPECIES OF NOTOSCOLEX.

1.	Male pores in the *b* line of setae—2.	
	Male pores medial to the *b* line of setae—3.	
2.	1 pair of sperm sacs	1. *N. maecenatis.*
	2 pairs of sperm sacs	3. *N. prestonianus.*
	3 pairs of sperm sacs	7. *N. leios.*
3.	Male pores medial to the *a* line of setae	6. *N. suctorius.*
	Male pores lateral to the *a* line of setae—4.	
4.	Spermathecal pores in the *b* line of setae	5. *N. rubescens.*
	Spermathecal pores medial to the *b* line of setae—5.	
5.	Penial setae with a forked distal tip	2. *N. hortensis.*
	Penial setae with a simple distal tip	4. *N. modestus.*

1. *Notoscolex maecenatis*, Michlsn.

Flesh coloured or brownish-red anteriorly ; the hinder part of the body white or gray owing to the colour of the gut-contents. Epilobous : segment 1 with a longitudinal dorsal-median furrow. Setae : $aa = 2\ ab$, $ab = \frac{10}{19}\ bc$, $bc = \frac{19}{26}\ cd$, $dd = \frac{9}{5}\ cd > \frac{1}{4}\ u$; setae *c* and *d* irregularly set in the last 20 segments. First dorsal pore in furrow 3/4. Clitellum saddle-shaped covering segments 14–17. Male pores on small oval papillae in the *b* line of setae in segment 18. Spermathecal pores, 2 pairs in furrow 7/8 and 8/9 in line *b*. The ventral surface of segments 10–19 is depressed, the depression extending to the *a* line of setae on each side and being bounded anteriorly by glandular thickenings in segments 8 and 9, and posteriorly by an elongated glandular ridge in furrow 19/20. Septa 6/7–12/13 thickened. Gizzard in segment 6 ; oesophagus swollen in segments 9–13, the wall being vascular and thrown into folds internally ; no calciferous glands ; mid-gut begins in segment 16. Last heart in segment 12. Meganephridia occur in about the last 20 segments. Testes and seminal funnels, 1 pair in segment 10 ; free seminal masses in segment 11 ; 1 pair of racemose sperm sacs in segment 12. Spermiducal glands flattened, rectangular, and loosely racemose, with a slightly bent duct. Penial setae simple with a sharp terminal bend ; distally the axis bends at right angles and widens to a delicate, slightly hollowed disc ; the distal end with the exception of the bent tip is marked by toothed annulations. Spermathecae with a flat sac-like ampulla the wall of which is apparently thrown into annular folds internally, these rings becoming irregular at the base ; the club-shaped diverticulum opens either into the base of the ampulla or the proximal end of the conical (or cylindrical) duct.

Length, 50–52 mms. ; diameter, 3 mms. ; number of segments, 120.

Locality : York.

2. *Notoscolex hortensis*, Michlsn.

Head epilobous ; segment 1 with a broad longitudinal mid-dorsal furrow which is separated from the true prestomium by a transverse furrow. Setae : $aa = cd > bc > ab$; at the hinder end $ab > aa$; $dd = \frac{1}{3} - \frac{1}{8}\ u$. First dorsal pore in furrow 4/5. Clitellum complete but less strongly developed ventrally, covering segments $\frac{1}{3}$ 13 or 14–17. Male pores on small oval papillae in segment 18 between the *a* and *b* lines of setae. Spermathecal pores, 2 pairs in furrows 7/8 and 8/9 immediately lateral to the *a* line of setae. Glandular thickenings occur on the ventral part of segments 8 and 9, sometimes with tiny ventral-median papillae in furrows 7/8 and 8/9 ; usually 1 pair of large flat papillae in line *a* in furrow 19/20. Septa 9/10–11/12 slightly

thickened. Gizzard in segment 6 ; oesophagus with internal structure resembling that of a calciferous gland but definite glands do not occur ; mid-gut begins in segment 15 and has a broad typhlosole. Last heart in segment 12. The nephridia of the last segment unite to form one pair of meganephridia. 2 pairs of testes and seminal funnels embedded in ripening sperm masses in segments 10 and 11 ; 2 pairs of large simple sperm sacs in segments 9 and 12. Spermiducal glands nearly as long as wide, consisting of closely pressed lobes, and with a delicate slightly curved duct. Penial setae delicate and tapering, the distal tip slightly flattened and forked, the two prongs of the fork sometimes bound together by a web ; with the exception of this tip the distal region is marked by broad scattered teeth closely pressed against the seta giving it a nodular appearance. Spermathecae narrow and irregular, tapering distally to a short bent duct ; a club-shaped diverticulum containing a single sperm chamber opens into the distal end of the ampulla.

Length, 35–45 mms. ; diameter, 2–2½ mms. ; number of segments, 106–120

Locality : Dongarra, Lion Mill, Jarrahdale, Gooseberry Hill.

3. *Notoscolex prestonianus*, Michlsn.

Colour, dirty gray. Head epilobous ; segment 1 with a longitudinal mid-dorsal furrow, and only faintly marked off from segment 2. Setae : $aa = 2ab$, $ab = \frac{2}{3}\ bc = cd$, $dd = \frac{1}{4}\ u$; at the hinder end : $aa = \frac{3}{2}\ ab = \frac{4}{5}\ bc$, $cd = \frac{2}{3}\ bc$, $dd = \frac{1}{2}\ cd$, and here seta d is twice as long and broad as seta a ; at the extreme distal end the dorsal setae are irregular in position. First dorsal pore in furrow 4/5 (3/4?). Clitellum complete but faintly developed ventrally and entirely lacking in the ventral part of the anterior and posterior segments ; it covers segments 13–17. Male pores on small oval papillae in the b line of setae in segment 18 ; spermathecal pores, 2 pairs in furrows 7/8 and 8/9 slightly lateral to line b. Accessory glands represented by 4 pairs of small oval papillae in furrows 15/16, 16/17, 19/20 and 20/21, slightly medial to the position of male pores, in line b or between a and b. Septa thickened in the region of the testes. Gizzard in segment 6 (?) ; oesophagus without calciferous glands. 2 pairs of testes and seminal funnels in segments 10 and 11 ; 2 pairs of sperm sacs, those in segment 9 small and simple, those in segment 12 large and racemose. Spermiducal glands broken into lobes ; duct short and distinct. 2 types of penial setae occur ; a slender form with a simple distal tip, the distal end beset with tiny scars each bearing a delicate tooth in its proximally directed cavity ; and a stouter form, simply curved, the distal tip (in one case) flattened and spatulate, and the distal region beset with large scattered teeth closely pressed against the shaft of the seta. Spermatheca with a pear-shaped ampulla swollen basally and merging into a short narrow duct ; a short simple diverticulum opens into the distal end of the ampulla.

Length : 30 mms. ; diameter, 2–2½ mms. ; number of segments, about 95.

Locality : Donnybrook.

4. *Notoscolex modestus*, Michlsn.

Colour, gray. Head epilobous ; segment 1 with a mid-dorsal furrow. Setae anteriorly $aa = 2ab = 1\frac{1}{2}\ bc = cd$, $dd < \frac{1}{3}\ u$; posteriorly $aa = \frac{3}{2}\ ab = bc = cd = dd$. Clitellum complete, covering segments 14–17. Male pores in segment 18 on papillae between the a and b lines of setae, the papillae being connected by a ventral-median glandular field. Spermathecal pores 2 pairs in furrows 7/8 and 8/9 immediately lateral to the a line of setae. Unpaired mid-ventral glandular pads extending to line a on each side occur

in furrows 16/17, 18/19, 19/20 and 20/21, also, but less distinctly in 7/8, 8/9, 9/10, and 17/18 ; in each case the intersegmental furrow is clearly visible ; these markings may be entirely lacking, or only the posterior 4 may occur. Septa 9/10 and 10/11 slightly thickened. Gizzard in segment 6 (segment 5 ?) ; oesophagus without califerous glands. Last heart in segment 12. Micronephridia occur in the anterior and middle regions of the body. Seminal funnels, 2 pairs, in segments 10 and 11 ; 2 pairs of large sac-like sperm sacs in segments 9 and 12. Spermiducal glands closely pressed against the body wall of segments 17–19, loosely racemose, with a short duct. Penial setae curved and tapering, the curve being sharper at the distal end ; typical ornamentation not definitely known but the distal end is apparently marked by long flat scars, and one seta had a small tooth just below the distal tip. Spermathecae elongated and sac-like ending proximally in a wart-like point, and merging distally into a short narrow duct ; a pear-shaped diverticulum opens into the distal end of the ampulla.

Length, 30–40 mms. ; diameter, $1\frac{1}{2}$–$2\frac{1}{2}$ mms. ; number of segments, 100–110.

Locality : Yarloop and York.

5. *Notoscolex rubescens*, Michlsn.

Colour, dirty gray, due to the colour of the gut contents ; the head end faintly pink. Head epilobous ; peristomium with a mid-dorsal longitudinal groove. Setae : $aa = \frac{3}{2}\, ab = bc < cd$; $dd = \frac{1}{4}u$; setae c and d irregularly placed in about the last 40 segments. First dorsel pore in furrow 5/6 (if not in 4/5 or 3/4). Clitellum saddle-shaped, covering segments 14/17. Male pores in segment 18 slightly lateral to the a line of setae on distinct papillae the bases of which extend from the a to b line of setae on each side. Spermathical pores, 2 pairs of transverse slits in the b line of setae in furrows 7/8 and 8/9. Accessory glands consist of elongated glandular streaks or ridges close before and behind each of furrows 15/16–19/20. Septa 6/7–12/13 somewhat thickened. Gizzard in segment 6 (5 ?) ; oesophagus without calciferous glands ; mid-gut without a typhlosole at least as far as segment 30. Micronephridia occur in the anterior and middle regions of the body —the posterior end is not known, 2 pairs of seminal funnels in segments 10 and 11 ; 1 pair of compressed racemose sperm sacs in segment 12 (a second pair in 9 ?). Spermiducal glands also racemose lying against the lateral and dorsal walls in the region of segments 17–20 ; duct short, narrow and s-shaped, and hidden beneath the glandular region. Penial setae faintly curved, the curve being sharp distally, the extreme tip slightly bent in the opposite direction, the convex side of the distal end, with the exception of the recurved tip, is beset with transverse rows of small thorns. Spermathecae with a thick pear-shaped or spherical ampulla about twice as long as the stout duct ; a small egg-shaped unstalked diverticulum opens at the junction of ampulla and duct.

Length, 35 mms. ; diameter, 2–$2\frac{1}{3}$ mms. ; number of segments, 102.

Locality : Pickering Brook.

6. *Notoscolex* (*Trinephrus*) *suctorius*, Michlsn.

Colour, yellow ; Head, epilobous ; segment 1 with a longitudinal mid-dorsal furrow. Setae : $aa = 1\frac{2}{3}\, ab$, $ab = \frac{2}{3}\, bc$, $bc = \frac{9}{8}\, cd$, $dd = \frac{4}{9}\, u$. First dorsal pore in furrow 4/5. Clitellum saddle-shaped, covering segments 13–18. Male pores in segment 18 medial to the a line of setae, in a depressed glandular oval area with raised margins. Sper-

mathecal pores, 2 pairs in furrows 7/8 and 8/9, medial to line *a*. Accessory glands consist of 2 pairs of large oval sucker-like papillae in furrows 15/16 and 16/17, their centra lying just above the *b* line of setae ; the whole of the ventral surface of segments 15–17 is glandular. Septa 9/10–11/12 slightly thickened. Gizzard in segment 6 ; oesophagus without calciferous glands, the internal wall thrown into slight folds ; mid-gut begins in segment 14 or 15. Last heart in segment 12. 3 micronephridia occur on each side of the body in each segment ; these unite in the last segments and appear to form one meganephridium on each side. 2 pairs of testes and seminal funnels and also free masses of ripening sperm matter in segments 10 and 11 ; 1 pair of lobed sperm sacs in segment 12. Spermiducal glands tongue-like with a notched margin and a broken surface ; duct shorter than the glandular region. Penial setae lacking. Spermathecae with a club-shaped ampulla merging into a short narrow duct ; a slender diverticulum opens at the junction of ampulla and duct.

Length : 35–55 mms. ; diameter, 2–3 mms. ; number of segments, 114–124.

Locality : Bridgetown.

7. **Notoscolex leios,** Sp. nov.

Pl. XV., Figs. 3, 5.

External features : Length, 95 mms. ; width, 3 mms. ; number of segments, 170.

The worm is of a smooth gray colour and unpigmented.

Head epilobate, the prestomium being cut off from the peristomium by a straight, transversely-running groove.

The setae are almost indistinguishable, and the entire body is marked by numerous fine annulations which give it a very smooth appearance.

The first dorsal pore lies between segments 4 and 5.

There was, in the specimen obtained, no clitellum and no accessory gland, and the spermathecal and genital pores were too small to be seen even with the aid of a lens.

Anatomy : Septa 6/7 – 13/14 are thickened, though very faintly in the case of 6/7.

Gut : There is a strong well-formed gizzard in segment 6. The oesophagus has no calciferous glands, but it is thick-walled and strong with a rich blood supply in segments 12 and 13, and again in segments 15 and 16. The mid-gut begins in segment 18.

The last heart is in segment 13.

The nephridial system is micronephric, the nephridia being arranged in lines encircling the body in each segment, though the number per segment does not seem to be constant. They are smaller in the anterior end of the body than in the posterior end and in segments 5–7 are numerous and closely packed.

There are three pairs of incompletely developed sperm sacs in segments 10, 11 and 12 and in segments 10 and 11 small whitish patches were seen on the posterior septa which were possibly the developing sperm-duct-funnels. The spermiducal glands in segment 18 are cylindrical with a nodular surface, and open to the exterior apparently in the *b* line of setae, through a muscular duct which is about one-third as long as the glandular region.

Penial setae are present. They lie in elongated sacs immediately anterior to and nearly as long as the spermiducal glands, which therefore, at first glance appear to be double. The setae themselves are about ·75 mm. long, slender and curved with a very finely, but not very closely toothed concave surface and with one tiny isolated tooth near the end of the convex surface.

The spermathecae are very small, probably not fully developed, with a sac-like body into the base of which opens a long slender cylindrical diverticulum. There are two pairs of spermathecae opening between segments 7–8 and 8–9.

Locality : Murchison.

Remarks : Only one specimen of this worm was found, and the condition of the genital system indicates that it is immature. The absence of clitellum and accessory glands is, therefore, probably due to incomplete development and is not a constant feature of the species.

6. Genus MEGASCOLEX. Templet.

More than 8 setae per segment at least in the middle and hinder region of the body. Spermathecal pores, 2–5 pairs between segments 4–9. 1 gizzard in segment 5, 6, or 7. Micronephridial. Spermiducal gland with a branching lumen.

Australia, Norfolk Is., Ceylon, and India (?).

KEY TO SPECIES OF MEGASCOLEX.

1.	Spermathecal pores unpaired—2.	
	Spermathecal pores paired—3.	
2.	2 Spermathecal pores	14. *M. syndetoporus.*
	3 spermathecal pores	2. *M. harveyensis.*
	5 spermathecal pores	1. *M. imparicystis.*
3.	Spermathecal pores medial to the *a* line of setae—4.	
	Spermathecal pores in or lateral to the *a* line of setae—5.	
4.	Spermathecae with glandular structures near the base ...	3. *M. whistleri.*
	Spermathecae devoid of glandular structures	13. *M. swarbricki.*
5.	Male pores medial to the *a* line of setae—6.	
	Male pores lateral to the *a* line of setae—7.	
6.	Spermathecal pores in the *a* line of setae	4. *M. purpurascens.*
	Spermathecal pores in the *d* line of setae	5. *M. bistichus.*
7.	Male pores between the *a* and *b* lines of setae—8.	
	Male pores in or lateral to the *b* line of setae—10.	
8.	Accessory glands occur—9.	
	Accessory glands do not occur	15. *M. albidus.*
9.	Accessory glands paired	7. *M. torbayensis.*
	Accessory glands median and unpaired	6. *M. monostichus.*
10.	Accessory glands occur—11.	
	Accessory glands do not occur	12. *M. longicystis.*
11.	Accessory glands in the form of rounded papillae—12.	
	Accessory glands in the form of transversely elongated pads ...	10. *M. galei.*
12.	Spermathecal pores in the *b* line of setae	8. *M. colliensis.*
	Spermathecal pores in the *c* line of setae	9. *M. albanyensis.*
	Spermathecal pores in the *e* line of setae	11. *M. collinus.*

1. *Megascolex imparicystis*, Michlsn.

Colour, dorsally dark violet, the head end gray, and ventrally a yellow or brownish gray. Head epilobous, segment 1 with a mid-dorsal longitudinal furrow ; or tanylobous, the dorsal projection of the prestomium bearing a transverse furrow. Setae : $aa = 1\frac{2}{3}\ ab$; setal ring with an irregular mid-dorsal break. Dorsal pores occur. Male pores very close together in segment 18 in an eye-like genital area. Spermathecal pores, 5, unpaired and mid-ventral in furrows 4/5–8/9. Accessory glands represented by 7 elongated unpaired mid-ventral pads in furrows 14/15–16/17 and 19/20–22/23 ;

the intersegmental furrow is visible along each pad. Septa 7/8–17/18 thickened. Gizzard in segment 6 ; calciferous glands lacking oesophagus swollen in segments 10–14 ; mid-gut begins in segment 18. 2 pairs of closely pressed racemose sperm sacs in segments 11 and 12 ; 2 pairs of seminal funnels in segments 10 and 11. Spermiducal gland leaf-like with a slightly bent muscular duct which is 2/3 the length of the glandular region. Spermathecae with a sac-like ampulla and a short narrow duct ; a small club-shaped diverticulum opens about half-way down the duct.

Length, 175 mms. ; diameter, 10 mms. ; number of segments, 168.

Locality : South-west Australia.

Remarks : 1907 *Megascolex imparicystis.* Sp. nov. Michaelsen : Die Fauna Sudwest-Australiens.

1926 *Megascolex affinis** Sp. nov. Nicholls and Jackson: Jour. Roy. Soc. Western Australia. Vol. XII., p. 145.

This species was described by Michaelsen in 1907 from one specimen the length of which was 175 mms. Last year a slightly smaller worm (140 mms.) was found, which, on account of several slight differences, was referred to a new species under the name *Megascolex affinis.* Recently a third specimen has been obtained from a garden in Mt. Lawley, and this, except for its exceptional size (450 mms.) has no features which justify its exclusion from the species *imparicystis.* The investigation of this third specimen has also led to the conclusion that the features on which the description of *M. affinis* was based were abnormalities and that its relations to the other two specimens are too marked to justify its separation into a new species. That all three belong to the same species seems the more likely, since a further knowledge of West Australian oligochaetes has shown that a great deal of variation occurs even among individuals of the same species.

The specimen described as *Megascolex affinis* differed from Michaelsen's type specimen chiefly in the slightly greater length of the diverticulum of the spermatheca and in the presence of a rudimentary third pair of sperm sacs in segment 13, but since only one specimen was collected it is impossible to be certain of the constancy of these two features. A third difference lay in the fact that in the type specimen elongated swellings occurred on the ventral surface in furrows 14/15, 19/20, 22/23, while the so-called *M. affinis* was devoid of accessory glands except for a very slight, probably glandular thickening of the ventral-median region of furrows 17/18 and 18/19. These two small swellings are, however, present in the specimen from Mt. Lawley in which the markings of the type specimen also occur with the exception of the swelling in 14/15, the only difference being that the swollen areas are all of equal size and not longer as they approach segment 18, as in the type specimen.

There is another point of resemblance between the so-called *M. affinis* and the giant specimen. The sperm sacs of the latter were found to contain dark-brown, hardened spherical patches which could easily be squeezed out from the surrounding tissue and which, when teased out and viewed under the microscope, were found to contain numerous sigmoid setae embedded in a dark granulated matrix. This matrix appeared to be quite structureless and suggested hardened secretion or a mass of disintegrating cells. A renewed examination of *M. affinis* revealed one small brown patch

* Dr. Gates has drawn attention to the fact that the name " affinis " was used by Perrier in 1872 for a species of *Perichaeta* which was later considered by Beddard to be a *Megascolex*, and suggests that though it is now ranked as a synonym for *Pheretima posthuma* this previous use of the term " affinis " would probably invalidate it for use to-day, even were the worm under discussion not now classed with *M. imparicystis*.

on one of the sperm sacs, the patch being found on removal to be identical with those of the larger specimen though it was smaller and contained but one seta. The significance of these bodies is unknown, for though they occur in the Lumbricidae they are always found in the body-cavity.

The above facts, together with the fact that neither testes nor ovary were observed in the earlier specimen, suggest that the so-called *M. affinis* is only an immature specimen of the same species as that of the giant earthworm from Mt. Lawley, and there seems to be little doubt, except for the difference in size, that the species is the *Megascolex imparicystis* of Michaelsen. It will in any case be convenient to class all three together until further specimens have been obtained.

For future identification a description of the species based upon the study of the giant form is appended below. It will be noted that it varies from Michaelsen's description of the type specimen only in minor points; the length of the duct of the spermiducal gland; the extent of the thickened septa; and the pigmentation of the gut. This last was not mentioned by Michaelson but probably it would not be noticeable in a specimen which had stood for some time in spirit. In view of the marked similarities the dark patches containing setae are of doubtful specific value.

External features: Length, 45 cms.; diameter, 10 mms.; number of segments, 176.

The worm is purplish-brown, dorsally, with a fine dark mid-dorsal line running from end to end. Laterally the colour fades to the creamy flesh tint of the ventral surface. In the pre-clitellar region the purplish tint is fainter. The clitellum itself is slightly browner than the rest of the body and, apart from the colouration, is noticeable only as a very slight construction of segments 12 or 13–19. Each of these segments is marked by an annulus immediately anterior to the setal ring.

The head is tanylobous, the anterior margin of the peristomium being wrinkled. The walls of the buccal cavity are capable of eversion, the worm using its mouth in a sucker-like fashion. These walls when withdrawn are thrown into folds, against which the smooth firm rather triangular dorsal region of the prestomium gives a pro-epilobous appearance to the head.

The dorsal pores are conspicuous and occur from furrow 5/6 onwards. During fixation a considerable quantity of coelomic fluid was extruded through these pores, the fluid being of a pale yellow colour, and containing corpuscles roughly circular in shape.

The setae are small and inconspicuous.

The external indication of the male pore is very slight, but apparently the orifice is paired, the two pores being very closely approximated on an indistinct papilla on segment 18.

The female pores are also barely visible, but appear to lie in the annulus of segment 14, the annulus being somewhat deepened in the mid-ventral region.

There are five mid-ventral unpaired spermathecal pores lying in furrows 4/5–8/9.

Anatomy: The septa in both the anterior and posterior regions are muscular and thickened. Anteriorly the thickening begins with septum 8/9, septa 10/11–14/15 being extremely strong, 15/16 slightly less so.

The gizzard, which is large and well-formed, lies in segment 6, though it extends over the length of three segments. The crop preceding the

gizzard is light brown in colour, this brown pigmentation occurring again as a deep brown band in each segment of the oesophagus, and being continuous for the whole length of the intestine, that is from segment 17 onwards. It is probably due to the presence of chloragogen cells, though no histological examination was made. There are no lateral califerous glands.

The last heart lies in segment 13.

The excretory system, as normally in *Megascolex* is micronephridial. The nephridia are disposed in the same plane in each segment. Anteriorly they are ventoral in position and somewhat tufted in appearance, but posterior to the clitellum they become larger and encircle the body.

There are two pairs of racemose sperm sacs projecting from septa 10/11 and 11/12 into segments 11 and 12. They are small and apparently not fully developed, but they contain black spherical patches which can be squeezed out intact and which, when teased and examined under the microscope, are seen to have numerous sigmoid setae embedded in the dark matrix.

There are two pairs of testes and their related funnels in segments 10 and 11. The funnels are quite distinct, but the testes are extremely small. The spermiducal glands are large, flattened, and leaf-like, with a slightly curved muscular duct, the length of which is roughly one-third that of the glandular region.

The ovaries, which project from septum 12/13 into segment 13, are tufted and fairly conspicuous.

The spermathecae are median and unpaired, each with a small diverticulum opening into the distal end of the duct. The main pouch varies somewhat in shape, the first being elongated and finger-like, the others irregular and sac-like. The last is probably abnormal in that it has no diverticulum.

Locality : Mount Lawley.

2. *Megascolex harveyensis.* Michlsn.

Colour, dorsally dark violet-brown, ventrally gray. Head pro-epilobous (?). Setae : $aa = 2ab$; the mid-dorsal break in the setal ring is irregular. First dorsal pore in furrow 5/6. Clitellum not known. Male pores in segment 18, very close together, in a mid-ventral trapezoidal depression with raised margins. Spermathecal pores, 3, unpaired and mid-ventral in furrows 6/7, 7/8, and 8/9. One pair of small papillae in the *b* line of setae in furrow 20/21. Septa of the testes-segments slightly thickened. Gizzard in segment 6 (?). No calciferous glands. 2 pairs of seminal funnels in segments 10 and 11 ; 2 pairs of slender sperm sacs in segments 11 and 12 ; spermiducal glands leaf-like with a very short narrow duct. Spermathecae with a pear-shaped ampulla and a short duct ; a club-shaped diverticulum opens into the proximal end of the duct. Length, 78–84 mms, ; diameter, 5–5½ mms. ; number of segments, 153–162.

Locality : Harvey.

3. *Megascolex whistleri*, Michlsn.

Colour, gray, the head end slightly reddish ; the gut-contents, nephridia, and spermiducal glands can be seen through the skin. Head epilobous with a mid-dorsal longitudinal groove in segment 1 (tanylobous with a transverse furrow on the dorsal extension of the prestomium ?) Setal rings with a regular mid-dorsal and mid-ventral break : $aa = 3\,ab$, $zz = 2yz$. First dorsal pore in furrow 4/5. Clitellum saddle-shaped covering segments 13–18. Male pores

in segment 18, very close to each other and opening through a mid-ventral transverse slit in an oval glandular area. Spermathecal pores, 2 pairs, close together and very near the mid-ventral line just behind furrows 7/8 and 8/9. Accessory glands consist of 2 small mid-ventral papillae in furrows 17/18 and 18/19, and 2 pairs of slightly larger papillae on the anterior margin of segments 19 and 20, those in 19 slightly farther apart ; usually 1 or more of the papillae are lacking. 2 or 2 pairs of tiny gland pores also occur close against the spermathecal pores. Septa 8/9–11/12 faintly thickened. Gizzard in segment 6 ; oesophagus without calciferous glands but vascular and the wall slightly folded internally. Last heart in segment 13. In the middle region of the body 3 micronephridia occur on each side in each segment uniting at the hinder end so as to appear to form a pair of meganephridia. 2 pairs of testes and seminal funnels in segments 10 and 11 ; 3 pairs of sperm sacs in segments 11, 12 and 13. Spermiducal glands flat and pressed against the body-wall, slightly longer than wide, with a duct $\frac{1}{3}$ as long as the glandular region. Spermathecae with an elongated ampulla half as long again as the duct ; a sausage-shaped diverticulum opens about half-way down the duct. Glands associated with the gland-pores mentioned above project into the body-cavity in the neighbourhood of the spermathecae.

Length, 38–45 mms. ; diameter, $2\frac{1}{3}$–3 mms. ; number of segments, 120–124.

Locality : Boyanup.

4. *Megascolex purpurascens*, Michlsn.

Colour brownish, slightly purple anteriorly, and yellowish-gray ventrally. Head tanylobous. Setal rings with a regular mid-dorsal and mid-ventral break : $aa = 3ab$, $zz = 2\frac{1}{3}\ aa$. First dorsal pore in furrow 5/6. Clitellum saddle-shaped covering segments 13–18. Male pores in segment 18 slightly medial to the *a* line of setae, on an oval mid-ventral papilla. Spermathecal pores 2 pairs in the *a* line of setae in furrows 7/8 and 8/9. Accessory glands represented by oval pads filling the entire length of the segment and extending laterally to the *b* line of setae on each side in segments 15, 16, 17, and sometimes also in 19 and 20. Septa slightly thickened in the anterior genital region. Gizzard in segment 6. Last heart in segment 13. 2 pairs of elongated sperm sacs in segments 11 and 12 ; 2 pairs of large seminal funnels in segments 10 and 11 ; spermiducal glands leaf-like, with a very small duct hidden in the body-wall. Spermathecae with a sac-like ampulla and a small diverticulum opening into the distal end of the duct.

Length, 43–48 mms. ; diameter, $3\frac{1}{2}$ mms. ; number of segments, 120–123.

Locality : Donnybrook.

5. *Megascolex bistichus*, Michlsn.

Colour : dorsally brownish-violet, ventrally yellowish-gray. Head tanylobous (?). Setal rings with a regular mid-dorsal and mid-ventral break : $aa = 2ab$, $zz = 2aa$. First dorsal pore in furrow 5/6. Clitellum saddle-shaped covering segments (13) 14–18. Male pores in segment 18 close to the mid-ventral line on a large round papilla. Spermathecal pores, 2 pairs ventro-lateral in furrows 7/8 and 8/9. 4–6 pairs of small sucker-like hollows in furrows 19/20–24/25 in the *b* line of setae, causing small papilla-like projections into the body cavity. Septa $\frac{7}{8}$–12/13 thickened. Gizzard in segment 6. 2 pairs of curved elongated sperm sacs in segments 11 and 12 ; 2 pairs of seminal funnels in segments 10 and 11 ; spermiducal glands tongue-

like with a short narrow duct. Spermathecae with a pear-shaped ampulla merging into the duct ; a slender club-shaped diverticulum opens into the distal end of the duct.

Length, 45 mms. ; diameter, $2\frac{1}{2}$ mms. ; number of segments, 129.

Locality : Donnybrook.

6. *Megascolex monostichus*, Michlsn.

Colour, brownish-violet dorsally, yellowish-gray ventrally. Head epilobous (?) ; segment 1 with a broad mid-dorsal furrow (head tanylobous ?). Setal rings with a regular mid-dorsal and mid-ventral break : $aa = 2ab = zz = 2\ yz$. First dorsal pore in furrow 4/5. Male pores in segment 18 between the *a* and *b* lines of setae, on small papillae which are connected by a glandular ridge. Spermathecal pores, 2 pairs, in furrows 7/8 and 8/9 immediately lateral to the *a* line of setae. 10 or 11 small unpaired mid-ventral papillae in furrows 14/15–16/17 and 19/20–25/26 or 26/27. Gizzard in segment 6 (?). 2 pairs of slender sperm sacs in segments 11 and 12 ; spermiducal glands leaf-like and uneven with a very short narrow duct. Spermathecae with a duct which is almost as long as the short sac-like ampulla ; a club-shaped diverticulum opens into the distal end of the duct.

Length, 65–80 mms. ; diameter, $4\frac{1}{2}$–5 mms. ; number of segments, 140–155.

Locality : Harvey.

7. *Megascolex torbayensis*, Michlsn.

Colour, reddish-brown or flesh-coloured dorsally, yellowish-gray ventrally. Head epilobous ; segment 1 with a mid-dorsal longitudinal furrow. Setal rings with a regular mid-dorsal and mid-ventral break : $zz = 2aa$, $aa = 2\frac{1}{2}$–4 *ab*. First dorsal pore in furrow 4/5. Clitellum only developed dorsally, in segments 14–17. Male pores in segment 18 on small papillae between the *a* and *b* lines of setae. Spermathecal pores, 2 pairs in furrows 7/8 and 8/9, slightly lateral to the *a* line of setae. Accessory glands consist of a pair of small papillae between the *a* and *b* lines of setae in furrow 16/17, and a similar pair in line *b* in furrow 19/20. Septa in the region of the sperm sacs slightly thickened. Gizzard in segment 6 (?). 2 pairs of seminal funnels in segments 10 and 11 ; sperm sacs in segment 11 (and 12 ?) ; spermiducal gland leaf-like with a very short duct. Spermathecae slender and sac-like tapering distally ; a slender club-shaped diverticulum opens into the distal end.

Length, 55 mms. ; diameter, $3\frac{1}{2}$ mms. ; number of segments, about 105.

Locality : Torbay.

8. *Megascolex colliensis*, Michlsn.

Colour, chestnut brown with a violet tint in the head region ; ventrally yellowish ; the pigmentation is paler or lacking in the region of the setae. Head epilobous ; segment 1 with a mid-dorsal longitudinal furrow. Setal rings with a regular mid-dorsal and mid-ventral break : $aa = 1\frac{1}{2}$–2 *ab*. First dorsal pore in furrow 3/4. Clitellum complete, covering segments 15–$\frac{1}{2}$/17 or 17. Male pores in segment 18 on whitish papillae in the *b* line of setae. Spermathecal pores, 2 (or 3 ?) pairs in the *b* line of setae in furrows 7/8–8/9 (6/7–8/9 ?). Accessory glands variable ; maximum, 5 unpaired mid-ventral papillae anteriorly placed in segments 11, 17, 18, 19,

20 ; a pair of smaller papillae in the *b* line of setae in furrow 19/20 ; and 2 pairs of tiny papillae in the *a* line of setae in segment 18. Septa 7/8–13/14 thickened. Gizzard in segment 6 ; oesophagus without calciferous glands ; mid-gut begins in segment 17. Last heart in segment 13. Sperm sacs, 2 pairs in segments 11 and 12 ; 2 pairs of seminal funnels in segments 10 and 11 ; spermiducal glands disc-like with a short narrow duct. Spermathecae with a sac-like ampulla merging into the duct ; a club-shaped diverticulum opens into the distal region of the duct.

Length, 32–52 mms. ; diameter, 2–2½ mms. ; number of segments, 55–115.

Locality : Collie and Fernbrook (formerly Lumenberg).

9. *Megascolex albanyensis*, Michlsn.

Colour, brownish dorsally, yellowish-gray ventrally, the head end faintly red. Head epilobous ; segment 1 with a mid-dorsal longitudinal furrow. Setal rings, except at the head end, with regular mid-dorsal and mid-ventral breaks : $zz = aa = 2ab$. First dorsal pore in furrow 5/6. Clitellum complete but indistinct, covering segments 14–17 (or 18). Male pores in segment 18 on papillae between the *b* and *c* lines of setae. 2 pairs of spermathecal pores in furrows 7/8 and 8/9 in the *c* line of setae. Accessory glands feebly developed : 1 pair of small papillae or glandular spots in furrow 19/20 between the *a* and *b* lines of setae. Septa 7/8–15/16 thickened. Gizzard in segment 6 ; oesophagus without calciferous glands ; mid-gut begins in segment 17. Last heart in segment 13. 2 pairs of elongated sperm sacs in segments 11 and 12 ; spermiducal glands, small and leaf-like with a very small duct. Spermathecae with an almost spherical ampulla merging into a short duct ; a short club-shaped diverticulum opens into the distal end of the duct.

Length, 55–60 mms. ; diameter, 3½–3¾ mms. ; number of segments, 100–108.

Locality : Albany.

10. *Megascolex galei*, Michlsn.

Colour, violet-brown dorsally, the setae marked by pale spots, and yellowish or brownish-gray ventrally. Head tanylobous, the dorsal projection of the prestomium divided by a transverse furrow. Setal rings with a regular mid-dorsal and mid-ventral break : $aa = 2\frac{1}{4}\, ab = zz$. First dorsal pore in furrow 4/5. Male pores in segment 18 in the *b* line of setae on small papillae connected by a transverse glandular ridge. Spermathecal pores, 2 pairs in furrows 7/8–8/9 between the *b* and *c* lines of setae. A large transversely-oval glandular pad occupies the ventral surface in furrow 15/16, extending in mature specimens over the length of segments 15 and 16, in which case it is divided into 2 by the intersegmental furrow. Septa 9/10–12/13 slightly thickened. Gizzard in segment 6 ; calciferous glands lacking. 2 pairs of testes and seminal funnels in segments 10 and 11, free or embedded in masses of ripening sperm ; 2 pairs of slender curved sperm sacs in segments 11 and 12 ; spermiducal glands leaf-like with a short, slightly bent duct. Spermathecae with a pear-shaped ampulla merging into a duct the wall of which is very similar in structure to the ampulla ; a simple diverticulum opens into the distal end of the duct.

Length, 70–75 mms. ; diameter, 4–5½ mms. ; number of segments 143–157.

Locality : Collie.

11. *Megascolex collinus*, Michlsn.

Colour, dorsally chestnut-brown with a purple colouration in the mid-dorsal region ; ventrally, yellowish-gray. Head epilobous. Setal rings with a regular mid-ventral break : $aa = 1\frac{1}{2}\ ab$. First dorsal pore in furrow 5/6 (?). Male pores in segment 18 on small papillae in the *b* line of setae. Accessory glands consist of 1 pair of small papillae in furrow 19/20 between the *a* and *b* lines of setae. Septa 7/8–14/15 thickened. Gizzard in segments 6 and 7 ; calciferous glands lacking. Last heart in segment 13. 1 pair of slender sperm sacs in segment 12 (a second pair in 11 ?) ; 2 pairs of seminal funnels in segments 10 and 11 ; spermiducal glands occupy segments 17 and 18 and are disc-like with a deeply grooved medial margin ; duct s-shaped and equal in length to the glandular region. Spermathecae pear-shaped and flattened, tapering distally but without a definite duct ; an extremely long, thin, irregularly-twisted diverticulum with a luman which dilates proximally to form a small sperm chamber, opens into the distal end of the spermathecal ampulla.

Length, more than 30 mms. ; diameter, 3 mms. ; number of segments, more than 64.

Locality : Broome Hill.

12. *Megascolex longicystis*, Nicholls & Jackson.

1926. *Megascolex longicystis*, Nicholls & Jackson. Journ. Roy. Soc. Western Australia. Vol. XII. p. 142.

Colour, purplish-brown dorsally with a dark mid-dorsal stripe, and yellowish-white ventrally ; the snout and posterior end are white tipped. Clitellum represented by a slightly paler band covering segments 14–18. Setal rings unbroken. Head epilobous ; segment 1 with a mid-ventral longitudinal groove. First dorsal pore in furrow 4/5. Male pores in segment 18 on small papillae in the *b* line of setae. Spermathecal pores, 2 pairs on the anterior margins of segments 8 and 9 in the *c* line of setae. Gizzard in segment 6. Calciferous glands lacking. Last heart in segments 13. Sperm sacs, 3 pairs in segments 10, 11, and 12 ; spermiducal glands leaf-like with an s-shaped duct. Spermathecae pear-shaped with a diverticulum 5–6 times as long as the ampulla.

Length, 70–80 mms. ; diameter, 3 mms. ; number of segments, aobut 100.

Locality : Armadale and Wongong.

13. *Megascolex swarbricki*, Nicholls & Jackson.

1926. *Megascolex swarbricki*, Nicholls & Jackson. Journ. Roy. Soc. Western Australia, Vol. XII., p. 143.

Colour, dorsally greyish-brown, ventrally yellowish-white. Head tanylobous. Clitellum saddle-shaped, covering segments 13–19. First dorsal pore in furrow 4/5. Male pores in segment 18 medial to the *a* line of setae on an oval papilla which is grooved before and behind the pores. Spermathecal pores 2 pairs, extremely close together in small depressed areas in furrows 7/8 and 8/9. Accessory glands variable ; usually 2–3 pairs of papillae in furrows 19/20–20/21 or 21/22, those forming the last pair, when present, closer together than those of the other pairs. Gizzard in segment 6 ; oesophagus with glandular dilatations in segments 10–14. Last heart in segment 13. 3 pairs of racemose sperm sacs in segments 10, 11, and 12 ; 2 pairs of

testes and seminal funnels in segments 10 and 11 ; spermiducal glands broad and leaf-like divided into 2 lobes by a deep groove on the medial side ; the duct opens into the posterior lobe of the glandular mass. Spermathecae elongated with a spherical head ; a club-shaped diverticulum opens into the short duct.

Length, 160 mms. ; diameter, 5 mms. ; number of segments about 188.

Locality : Nornalup.

14. **Megascolex syndetoporus,** Sp. nov.

Pl. XV., Fig. 1. Text-figs. 10, 11.

External features : Length, 105 mms. ; thickness, 6 mms. ; number of segments, 173.

Colouring : dorsally purplish-brown, ventrally creamy-white. The head is tanylobate, with a transverse furrow across the tapering base of the prestomium. There is also a suggestion of a longitudinal median furrow dividing the prestomium into two indistinct lobes.

The rings of setae have a regular mid-dorsal interruption. Ventrally and posterior to the clitellum they are also interrupted, but anterior to the clitellum the break is not apparent.

The first dorsal pore occurs between segments 4 and 5, except in one specimen, where there was a small pore at intersegment 3/4.

The clitellum is thick and saddle-shaped and covers segments 14–19, extending ventrally as far as the *c* line of setae. In some of the specimens segment 13 was also covered by a thin layer of clitellar tissue.

The male pore is unpaired and lies in segment 18 on a transversely elongated median papilla, the anterior and posterior margins of which tend to overhang the pore. Transverse sections show that the papilla is muscular in structure with a cluster of glandular patches embedded deeply in it.

The spermathecal pores are also unpaired, and lie in tiny oval depressions in the mid-ventral line between segments 7–8 and 8–9.

The accessory glands are mid-ventral in position and unpaired, and consist of fairly large rounded papillae each with a glandular core which is rather clearer in appearance than the surrounding tissue. The number of these glands which may be present seems to be extremely variable, and may be as many as seven ; three before the male pores, at intersegments 14/15–16/17, and four after, at intersegments 19/20–22/23 (this number occurs in the majority of the specimens taken and probably forms the normal condition), or they may be reduced to one or two before and one, two, or three after the segment of the male pores. In no case, however, do they occur at intersegments 17/18 or 18/19.

Anatomy : The gut has a large gizzard in segment 6. The oesophagus has no calciferous glands, but in each of segments 10–14 (in one case 10–15) it is thicker walled and swollen and has a rich blood supply. The mid-gut is thin walled and wide and begins in segment 17.

Micronephridia occur throughout the length of the body. In segment 3 they are very numerous and are clustered together so as to form a tuft on each side of the gut. These apparently function as peptonephridia for transverse section showed traces of ducts on each side leading towards the ventral surface of the gut.

Male reproductive organs : There are two pairs of sperm-duct-funnels in segments 10 and 11. These two segments are filled with a mass of sperm

morulae which must be removed before the funnels or sperm sacs can be seen. Of the latter there are three pairs, each sac being rather elongated and finger-like with a somewhat broken surface. They project from septa 9/10, 10/11 and 11/12 into segments 10, 11 and 12. Those in segment 10 are smaller than those in either of the other two segments. The spermiducal glands are large, thick, and flattened, and open to the exterior through very short straight muscular ducts which are barely longer than the thickness of the body-wall, and which lead to a common median pore.

The female reproductive organs are of the usual type and structure with ovaries and oviducal funnels in segment 13.

There are two pairs of spermathecae. They are large and sac-like, with a wide neck into the base of which opens a club-shaped diverticulum. This diverticulum varies in length from slightly less than, to about two-thirds that of the main body of the spermatheca. A narrow duct leads to the exterior, the two ducts in each of segments 8 and 9 opening by a common median pore at intersegments 7/8 and 8/9.

Locality : Pemberton.

15. **Megascolex albidus**, Sp. nov.

Pl. XV., Fig. 2. Text-fig. 12.

Only two specimens of this worm, both mature, were collected. External features : length (after preservation in spirit) 75 mms. ; breadth, 3 mms. ; number of segments, 130.

Colouring : In spirit they are creamy-white and unpigmented, with a light brown clitellum.

The head is pro-epilobous. The prostomium projects backwards through about half the length of the peristomium, which is itself further divided by a mid-dorsal and a mid-ventral longitudinal groove.

The setal ring has a regular break both dorsally and ventrally. *aa* is roughly equal to 2 *bc*, while the setae *a* and *b* are slightly closer together than the others of the ring. The setae themselves are sigmoid, and slightly ornamented, having a group of tiny longitudinally arranged lines in the region of the nodulus. A few of the setae which were taken from segments a little posterior to the male genital region were marked by the presence of a slight notch in front of the nodulus. These notched setae had also slight markings both near the tip and posterior to the nodulus.

The first dorsal pore occurs between segments 4 and 5.

The clitellum is saddle-shaped and very sharply defined. It covers segments 13–18 dorsally, and 14–17½ ventrally, extending as far as setal line *b*.

The male pores are on a pair of rounded papillae on segment 18. The pores themselves are between the *a* and *b* lines setae, and the papillae so close as to merge into each other by a narrow neck. Around and between these papillae the surface is depressed, and surrounding the whole is a well defined wall.

The female pores are in segment 14, slightly anterior to the setal ring. The spermathecal pores are rather slit-like, and lie in the *a* line of setae in furrows 7/8 and 8/9.

There are no other genital markings.

Anatomy : The septa from 9/10 to 14/15 are all slightly thickened.

Gut : There is a well-developed gizzard in segment 6. The oesophagus is marked by vascular swellings in segments 11 to 17, those in segments 13 and 17 being the largest. The mid-gut, which has no typhlosole, commences in segment 19.

Nephridial system : Micronephridia occur. They are arranged in lines which encircle the body in each segment.

Circulatory system : The last heart is in segment 13.

Male organs : There are three pairs of sperm sacs. They are flattened and rather fanlike structures occurring in segments 10, 11 and 12, those forming the last pair being the smallest. The testes could not be made out, but there is a pair of free funnels in each of segments 10 and 11. The margins of the funnels seem to be divided into three lobes with extremely long fringing cilia. The spermiducal glands in segment 18 are thick and flat and almost pear-shaped, with a very short duct. There are no penial setae, though those surrounding the male genital field seem to be slightly shorter and stouter than the rest and there are two in each sac.

Female organs : The ovaries are in segment 13. They are exceptionally large and are divided into a number of moniliform branches. This condition is probably merely due to the extreme ripeness of the ovary.

The spermathecae are large and ampulla-shaped, with the head bent slightly to one side. The diverticulum is slender and straight and is about half as long as the main body.

Locality : Condinup.

7. Genus Pheretima, Kinb.

More than 8 setae per segment. Spermathecal pores 1–6 pairs between segments 3–9. 1 gizzard in segment 8 or between septa 7/8 and 10/11. Micronephridial. Seminal funnels contained in sperm reservoirs. Spermiducal gland with a branching lumen. Penial setae do not occur.

South-east Asia, Malay Archipelago, Australia.

Pheretima heterochaeta, (Beddard).

Text-figs. 13, 14, 15.

Colour, brownish. Head epilobous. Setae of segment 10 smaller than those of the neighbouring segments. Clitellum complete, covering segments 14–16. Male pores on papillae in segment 18. Spermathecal pores 4 pairs in furrows 5/6–8/9 ; small glandular papillae occur medial to the spermathecal pores in segments 7 and 8, sometimes also in 6 and 9. Septa 8/9 and 9/10 lacking. Gut with a pair of simple diverticula. 2 pairs of sperm reservoirs, those in segment 10 communicating with each other, those in segment 11 united ; 2 pairs of sperm sacs in segments 11 and 12 ; spermiducal glands more or less rudimentary, with a curved duct. Spermathecae with a pear-shaped ampulla, a moderately long narrow duct, and a club-shaped diverticulum.

Length, 60–160 mms. ; diameter, 3–4 mms. or more ; number of segments, 91–100.

Locality : Perth and Boyanup.

Distribution : Hawaii, Japan, New Caledonia, New South Wales, India, Madagascar, Europe, Azores, Columbia, Florida, Georgia, California.

Remarks : This species has been recorded by Michaelsen (1907) from an orchard at Boyanup. One only of the three specimens collected by him

showed distinct glandular development, two pairs of small papillae occurring in the normal position, that is anterior to the setae and slightly medial to the tpermathecal pores in segments 7 and 8.

Numerous specimens may readily be taken at the Government Gardens, Perth, but these show a considerable variation in the glandular arrangement. The majority have six pairs of papillae ; three pairs on the anterior third of segments 7–8–9, and three pairs of very small papillae placed more anteriorly still on the same three segments immediately ventral to the last three spermathecal pores on each side. Any one, two, or more of these papillae may be present, or they may be lacking entirely. The glands underlying the larger papillae project into the body-cavity in the form of a flat bilobed fan.

There is no spermiducal gland. The vasa deferentia merge into stout muscular ducts which open on papillae in segment 18. In dissections a glandular mass can be seen above each male pore, and in one specimen a pair of small papillae occurred in the ventral surface, also slightly anterior to the male pores. Serial sections were made of this specimen and it was seen that the necks of the glands of this mass are elongated and open at the apex of the small papilla. This condition—two pairs of papillae on segment 18—is similar to that in *Ph. perkinsi* Bedd., and may perhaps be taken as offering a little support to Michaelsen's statement (1907) that there is no ground for the separation of the *perkinsi* forms as was suggested by Ude. It is true the condition only occurred in one specimen, but the underlying glandular mass was present in all cases. It is probable that the mass is prostatic, the papillae appearing only when the glands are functional.

The lymph glands are large and conspicuous and agree with the description made by Thapar (1918), but the coelomic organs of Beddard and Fedarb, referred to by Thapar in the same paper, could not be distinguished in any of the eight or nine specimens dissected.

The length of the diverticulum of the spermatheca is variable : it may be short and stunted or nearly twice as long as the main pouch, and in all the specimens examined was infested by *Monocystis*. It is possible that this variation may be a distortion due to the presence of the parasite, though normally *Monocystis* has no effect on the tissues of its host. On the other hand *Pheretima heterochaeta* is known to be a very variable species, though one would expect to find it constant at least for a definite locality.

Specimens differing from the type species have also been recorded by Stephenson (1914 and 1922) and Gates (1926).

3. SUB-FAMILY OCNERODRILINAE.

Genus KERRIA. Beddard.

Male pores in segment 18 ; pores of the spermiducal glands, 2 pairs in segments 17 and 19 ; spermathecal pores, usually 2 pairs in furrows 7/8 and 8/9, the former sometimes lacking. 1 gizzard in segment 7, or none ; 1 pair of oesophageal pouches in segment 9. Spermiducal glands, 2 pairs (rarely double) ; 1 pair of testes in segment 10 (testes unknown in some species) ; Spermathecae usually without a diverticulum, rarely with a distal sacculation to the ampulla.

Subtropical South America, Lower California, and South-West Australia.

Kerria nicholsi, Sp. nov.

Pl. XVI., Figs. 5, 8, 9, 11.

External features : length, 55–70 mms. ; breadth, 1·5 mm. ; number of segments about 112.

In life the worm is colourless or of a creamy flesh-colour, with a yellowish clitellum and an unpigmented body wall through which the red blood can be seen. The nephridia are also visible through the skin, looking like a row of white patches down each side. After preservation in formalin the specimens often appear gray owing to the dark nature of the contents of the gut.

The head is zygolobous.

The setae, which are of the normal sigmoid type, are arranged in four pairs in each segment so that $aa = bc$ and $dd < \frac{1}{2}u$. The clitellum is saddle-shaped and covers segments 14–20. The male genital area forms a four-sided field on the ventral surface of segments 17–19. On each of segments 17 and 19 is a pair of large rounded glandular papillae lying immediately lateral to the *b* line of setae. The ducts of the four spermiducal glands open through these papillae on the walls nearest the ventral-median line, the first pair of pores being slightly anterior, the second slightly posterior to the axis passing through the centres of the papillae in each segment. The apices of the glandular papillae on each side are connected by a seminal groove which has a slight convex curve towards the mid-ventral line. The male pores lie in the *b* line of setae, in segment 18, and open into the most ventral point of the curve of the seminal grooves.

The spermathecal pores lie between segments 7–8 and 8–9, slightly below the *c* line of setae.

Anatomy : Septa 5/6–11/12 are thickened, the first and last only slightly so, but septa 6/7–10/11 are extremely strong. All of these septa are often distorted and thrown into folds and are connected to the body-wall by very thick muscular strands. Septal glands occur on septa 5/6–8/9 and take the form of large irregular masses of glandular tissue.

Gut : The buccal cavity leads to a pharynx which is lined dorsally by tall ciliated columnar cells and which has one or two short arms penetrating the pharyngeal mass. The gizzard, which in dissection has a clear almost transparent appearance, occupies segment 7. It is not very large and does not overlap either of the neighbouring segments. In structure it is thick-walled and muscular, but the entire oesophagus is very strong and in section sometimes resembles a chain of small gizzards. In segment 9 the oesophagus is thinner walled and has a pair of long somewhat ventrally-placed forwardly-directed, pear-shaped pouches with walls of large closely packed cells having a rich blood supply. These oesophageal pouches vary slightly in size in the different specimens and may be so large as almost to fill the entire segment. From segment 9 onwards the oesophagus has a ciliated lining. The mid-gut begins about half-way through segment 12.

The last heart is in segment 11.

The nephridial system is meganephric, the first nephridium occurring in segment 9. In structure each nephridium consists essentially of a coiled duct surrounded by a mass of large loosely bound cells, the nuclei of which stain very readily in borax carmine.

Male reproductive organs : There is only one pair of rather elongated testes projecting from septum 9/10 into segment 10, and a corresponding pair of spermiducal funnels leading back through septum 10/11 into the sperm ducts, which open to the exterior in segment 18 independently of the spermi

ducal glands. There are two pairs of sperm sacs in segments 9 and 11 and a certain amount of developing sperm matter lying freely in segment 10. The spermiducal glands consist of four long slender thread-like tubes extending through segments 15–21. They have moderately long muscular ducts which open to the exterior immediately lateral to the *b* setae in segments 17 and 19. The glandular region of each is typical of the Ocnerodrilinae and consists of narrow lumen surrounded by a single layer of gland cells.

The female reproductive organs are normal. There is a pair of extremely large ovaries in segment 13, with obliquely placed oviducal funnels leading through septum 13/14 to open to the exterior in segment 14 in the *b* line of setae. The ova are spherical, and when ready to be freed from the ovary measure ·05 mm. in diameter.

The spermathecae have a sac-like head and a thick-walled duct and are without a diverticulum. The relative lengths of the head and the duct appear to vary quite considerably, and when the duct is proportionately long it has a tendency to twist—this condition was only found in one specimen.

Locality : South Perth, in swampy ground near the margin of the Swan River.

Distribution : South America and South-west Australia.

Remarks : The species approaches most closely to *K. garmani* of Central Paraguay, but differs in the setal distances, the shape of the spermathecae and the length of the spermiducal glands. It is the first of the Ocnerodrilinae to be recorded from Western Australia, and has been named after the collector, Professor Nicholls.

12. FAMILY LUMBRICIDAE.

KEY TO THE GENERA OF LUMBRICIDAE.

1.	Gizzard confined to 1 segment ; spermathecal pores between the *d* line of setae and the mid-dorsal line	1. *Eiseniella.*
	Gizzard extending through 2–4 segments—2.	
2.	Testes and seminal funnels free—3.	
	Testes and seminal funnels usually enclosed in sperm reservoirs, rarely in incomplete coelomic chambers formed by the growing together of the septa or by strands of tissue ; in latter case more than 3 pairs of spermathecae occur—4.	
3.	Spermathecal pores single, near or in the mid-dorsal line ...	2. *Eisenia.*
	Spermathecal pores sometimes lacking, usually single in or beneath the *d* line of setae, sometimes in groups partly in and partly above line *d*	3. *Helodrilus.*
4.	Testes and seminal funnels enclosed in a median unpaired sperm reservoir ; 3 pairs of sperm sacs in segments 9, 11, 12 ; 2 pairs of spermathecae	5. *Lumbricus.*
	Testes and seminal funnels enclosed in paired sperm reservoirs or in incomplete coelomic chambers in which case there are as a rule more than 2 pairs of spermathecae ; 4 pairs of sperm sacs	4. *Octolasium.*

1. Genus EISENIELLA Michlsn.

Head usually epilobous. Setae of each pair close together. Clitellum begins in segment 23 or further forward and covers 4–8 segments. Male pores in segment 15, or 2 or 3 segments earlier ; spermathecal pores, 2 pairs between the *d* line of setae and the mid-dorsal line. Gizzard in segment 17. Testes and seminal funnels project freely into the body-cavity ; 4 pairs of sperm sacs in segments 9–12.

Syria, Palestine, Europe, Azores, Canary Is., North America, Chile, Cape of Good Hope, New Zealand, New South Wales, Western Australia.

1. *Eiseniella tetraedra* (Sav.) forma typica.

Head epilobous. Middle and posterior regions of the body four-sided. Setae : *aa* = *bc*, *dd* slightly greater than *bc*. First dorsal pore in furrow 4/5. Clitellum covers segments 22 or 23—26 or 27, the glandular walls extending over segments 23 or ½23—25 or 26. Male pores in segment 13 with thickened glandular margins.

Length, 30–50 mms. ; diameter, 3–4 mms. ; number of segments, 70–90.

Locality : Albany.

Distribution : North America, Chile, Azores, Canary Is., Europe, Palestine, Syria, Cape of Good Hope, New Zealand, New South Wales, Western Australia.

2. **Eiseniella intermedius,** Sp. nov.

Pl. XVI., Figs. 4, 6, 7. Text-fig. 16.

External features : length, 50mms. ; breadth, 2·5 mms. ; number of segments, 72.

Colouring : Brown anteriorly and dorsally, but posterior to the clitellum which in life is orange coloured, the brownish tint is confined to a narrow median band. Ventrally the colour fades to a light yellowish brown.

The head is epilobous and the body rounded, with the exception of the posterior third, which is four-sided.

The setae are of the simple sigmoid type and are arranged in four pairs on each segment, *aa* being equal to about 3*ab*, *ab* to *cd*, and *dd* measuring slightly less than ½*u*. The distance between the pairs of setae becomes greater posteriorly so that the body when seen in transverse section has a rectangular shape. In *Eiseniella tetraedra* this rectangular condition also occurs, but the region is not so limited and embraces both the mid and hind-body. The two ventral pairs of setae in segment 10 are enclosed in greatly elongated muscular sacs which open to the exterior by cup-like pits in the body-wall. These four genital setae are about twice the length of the normal setae, and are more sharply pointed, with immediately behind the sharp tip, a swollen apex which tapers away to a slender waist-like region, the seta becoming the thicker and stronger again at the base.

Dorsal pores are present, the first occurring between segments 5 and 6.

The clitellum extends over segments 22–27, differing from the arrangement normally prevailing in the lumbricidae in being complete, though much thicker dorsally and laterally than ventrally. The glandular walls lie between setal lines *b* and *c* extending over a distance equal to the length of three segments from ½23 to ½26. The segments 19, 20, and 21 have each a ventral pair of glandular swellings indistinguishable in colour from the rest of the body. They resemble rather elongated papillae, the pair on segment 19 being the largest.

The male pores open into transversely elongated grooves with thickened lips, which lie between the setal lines *b* and *c* in segment 13. In one specimen one of these pores was found to open on segment 12, the other being normal in position.

The female pores open on segment 14 in the setal line *a* but they cannot be made out without having recourse to serial sections.

The spermathecal pores, of which there are two pairs, are large and conspicuous, and lie in intersegments 9/10 and 10/11, between setal line *d* and the mid-dorsal line.

Anatomy : The septa 6/7 to 12/13 are slightly thickened.

Gut : The pharyngeal mass of glandular muscular tissue extend back as far as segment 7. There is a lateral pair of calciferous glands in segment 10. The wall of the gut itself, from the region immediately behind the calciferous glands in segment 10 to the end of segment 13 is of the type usually associated with the oesophagus of the Lumbricidae : extremely thick, divided into a number of lacunae by longitudinal muscle strands each strand being penetrated by blood vessels, and with a ciliated internal lining. Cilia also occur in the dorsal branch of the pharynx which penetrates the pharyngeal mass. Segments 15 and 16 are occupied by the crop. This is followed by a single gizzard. It is difficult to determine whether the gizzard occupies one or two segments. In dissection it would appear to occupy only segment 17 though forcing septum 17/18 back so as it appears to lie also in segment 18. Serial sections seem to indicate that it occupies both of these segments though tapering away in the latter. In one specimen serial sections showed a dorsally directed fold on each side of the wall of the mid-gut as though this has been pulled up by the tightened septa. Sections cut of a second specimen did not show these folds, which suggests that they are probably merely due to distortion during fixation. A typhlosole occurs.

Circulatory System : The last heart is in segment 11. Both the hearts and the dorsal vessel in this region are extremely thick-walled and strong, the cells of the wall appearing to have a glandular nature.

Nephridial System : The nephridia are of the normal meganephric type consisting of a loosely bound tube with a muscular duct.

Male Reproductive Organs : There are two pairs of testes and funnels projecting freely into the body cavity in segments 10 and 11. In the specimen sectioned there seemed also to be a small mass of testis-like tissue projecting forward into segment 9. The vasa deferentia are much convoluted and the first pair, after passing back through one segment enter the body wall and lie just within the longitudinal muscle layer. The two vasa deferentia on each side eventually unite and open to the exterior through a pore which is situated at the end near the setal line *c* of the male genital groove in segment 13. As usual in the Lumbricidae there is no prostate, but the ventral body-wall in this region is extremely glandular, the glands seeming to be directed rather towards the ventrally placed end of the genital groove. This glandular nature of the body-wall, more particularly of the inner surface of the longitudinal muscle layer is noticeable as far forward as segment 8, and continues to the end of segment 14. There are four pairs of sperm sacs in segments 9–12, those in segment 10 being rather smaller than the rest. The septum 12/13 also has two sacs which project into segment 13, and seem to be of the same nature as sperm sacs, but in all the specimens examined they were merely empty pouches of septal tissue—with one exception, and in that case the sperm sac from segment 12 was extremely large and had pushed back in to the empty sac.

Female Reproductive Organs : The type and arrangement of these are normal. The ovaries are in segment 13, into which the richly ciliated oviducal funnel projects through septum 13/14. The duct opens to the exterior in segment 14 in the *a* line of setae.

The spermathecae are of the typical lumbricid type : rounded, almost spherical bodies with a short strong duct, and without a diverticulum.

Locality : Numbers of this worm were taken from the fresh water along the margin of Monger's Lake.

Remarks : The species seems in some respects to lie between the genera *Eiseniella* and *Eisenia*, both of which are represented in this State and were recorded (*Eiseniella tetraedra* and *Eisenia foetida*) from Albany by Michaelsen in 1905. The chief distinction between it and *Eiseniella* is the position of the last pair of spermathecal pores, which lie one segment further back in the species here described, that is, between segments 10 and 11, as in *Eisenia*. The position of the last pair of spermathecal pores seems hitherto to have been one of the most constant features of all members of a genus, and the condition in the present case may have sufficient taxonomic value to justify the establishment of a new genus. But for the present, lacking other related species, it is convenient to include it in the very closely related genus *Eiseniella*.

It may be noted that one specimen disagreed from the rest in that in the clitellum covered segments 18–22, and the male pore was in segment 8.

	Eiseniella.	Sp. nov.	*Eisenia*.
Head	Epilobous	Epilobous ...	Epi- or Tanylobous.
Setae	Close together. Ventro-lateral and dorso-lateral	Mod. far apart. Ventro-lateral and lateral	Close, moderately far, or far apart.
Clitellum	Segment 23 or earlier and covering 4–8 segments	Segments 22–27 ...	Segments (23–27) to (30–34).
Male Pore ...	Segment 15, or 2 or 3 segments more anterior	Segment 13 ...	Segment 15.
Spermathecal Pores	2 pairs ; between *d* and mid-dorsal line at furrows 8/9 and 9/10	2 pairs ; between *d* and mid-dorsal line at furrows 9/10 and 10/11	2 or 3 pairs; above *d* and near to or in the mid-dorsal line, at furrows 8/9 or 9/10–10/11.
Gizzard	Segment 17 ...	Segment 17 and 18	Continues through more than one segment.
Testes and Funnels	Free	Free	Free.
Sperm Sacs ...	4 pairs in segments 9–12	4 (+1) in segments 9–12 (13)	3 or 4 pairs in 9, 11, and 12, or 9–12.

2. Genus EISENIA Malm.

Head epi or tanylobous. Male pores in segment 15 ; spermathecal pores, 2 or 3 pairs in furrows 8/9–10/11 or 9/10 and 10/11, very close to or in the mid-dorsal line. Gizzard extends through more than 1 segment. Testes and seminal funnels not contained in sperm reservoirs ; 3 or 4 pairs of sperm sacs in segments 9, 11 and 12, or 9–12.

Siberia, Palestine, Syria, Armenia, Europe, North Carolina, Georgia. A few species are cosmopolitan.

Eisenia foetida, Sav.

Text-fig. 17.

In life, each segment with a red brown or purple band, the colour fading away ventrally ; lateral regions of segments 9–11 also devoid of pigments. Head epilobous. Setae ornamented ; *aa* = *bc*, *dd* = $\frac{1}{2}u$. First dorsal pore in furrow 4/5. Clitellum covers segments 24, 25, or 26–32, the glandular walls extending from 28 or $\frac{1}{2}$28–30 or 31. Spermathecal pores, 2 pairs in furrows 9/10 and 10/11 near the mid-dorsal line.

Length, 60–90 mms. ; diameter, 3–4 mms. ; number of segments 80–110.

Locality : Kalgoorlie, Monger's Lake and Albany.

Distribution : Almost cosmopolitan.

Remarks : It is not possible with the available literature to be quite certain of the species to which the specimens from Kalgoorlie and Monger's Lake belong. They agree with the description made by Michaelsen in "Das Tierreich" (given above) except that the setal distance *aa* is slightly greater than *bc*, and *dd*, anterior to the clitellum, is greater than $\frac{1}{2}u$. Also, in his brief account, no mention is made of the fact that each pair of ventral setae in the clitellar region is surrounded by a whitish rectangular patch. In transverse section it is seen that these patches are caused by the presence of cup-like orifices through which the setae project. This same condition is found in the lateral setal-bundles of the testes segments.

In many of the specimens collected occasional segments were incomplete, and this caused asymmetry of the organs, the spermathecae and spermiducal funnels, etc., lying one segment further back on one side than on the other.

When the living specimens were plunged into spirit a quantity of yellow matter was extruded through the dorsal pores. This coelomic fluid consisted of numerous small masses of tiny spherical globules.

Numerous specimens were found at Monger's Lake in September, 1926. Some were gathered together under an old piece of sacking, while others were entangled in the roots of weeds at the water's edge. This agrees with the account given by W. W. Smith (1894) of the habit of these worms, then known as *Allobophora foetidus*, of depositing cocoons under flat stones, wood, or old bags, the deposition taking place from August to December.

3. Genus HELODRILUS. Hoffm.

Head usually epilobous. Male pores in segment 15 ; spermathecal pores sometimes lacking, usually single in or below the *d* line of setae, sometimes in groups in and above line *d*. Gizzard extends through more than one segment. Testes and seminal funnels project freely into the body cavity.

Asia, Europe, Africa, islands of the Atlantic, North and South America, Hawaii, New Zealand, Australia.

1. *Helodrilus* (*Allolobophora*) *caliginosus* Sav.

Head epilobous. Setae *aa* > *bc*, *dd* = $\frac{1}{2}u$. First dorsal pore in furrow 8/9 or 9/10. Clitellum saddle-shaped covering segments 27 or 28–34 or 35 : glandular tubercles 2 pairs in segments 31 and 33 or united to form walls which extend over segments 31–33 or 34. Lips of the male pores thick and glandular ; spermathecal pores, 2 pairs in furrows 9/10 and 10/11 in the setal line

cd. Setae *ab* of segments 9, 10, and 11 usually on wide papillae and modified as genital setae. Septa 5/6–9/10 thickened. Sperm sacs small in segments 9 and 10.

Length, 60–160 mms. ; diameter, 4–5 mms. ; number of segments, 104–248.

Locality : Very common all over the south-west of Australia.

Distribution : Nearly cosmopolitan.

2. *Helodrilus* (*Bimastus*) *parvus*, Eisen.

Colour, reddish-brown. Head epilobous. First dorsal pore in furrow 5/6. Clitellum saddle-shaped covering segments 24–30, the glandular walls being indistinct and extending over segments 25 or 26–29 or 30. Male pores with small but distinct lips. Sperm sacs racemose and compressed in segments 11 and 12. Spermathecae lacking.

Length, 25–40 mms. ; diameter, 1–2 mms. ; number of segments, 85–111.

Locality : Mundaring Weir.

Distribution : North America, Argentine, Cape of Good Hope, St. Paul, Tibet, Australia.

Remarks : A single specimen found by Michaelsen at Mundaring Weir is the only representative of the species that has hitherto been found in Australia.

3. *Helodrilus* (*Bimastus*) *constrictus*, Rosa.

A red pigmentation occurs dorsally. Head epilobous. Setae : *bc* > *cd*, *cd* > *ab*. First dorsal pore in furrow 5/6. Clitellum covers segments 26–31 ; glandular walls lacking. Male pores with distinct glandular margins. Setae *ab* in segment 16 usually on broad indistinctly-marginated papillae.

Length, 20–30 mms. ; diameter, 3 mms. ; number of segments, 90–105.

Locality : Cranbrook and Albany.

Distribution : North and South America, Europe, South Siberia, Unalaska, Hawaii, South-west Australia.

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EXPLANATION OF PLATES.

PLATE XIV.

Fig. 1. Diagram of the ventral aspect of *P. bermudensis* Bedd. Forma *ephippiger* Rosa, as found at Cottesloe.
2. Diagram of the ventral aspect of *P. albanyensis* Mchlsn. var. **cygni** var. nov.
3. Spermatheca of same.
4. Distal end of seta of same.
5. Spermiducal gland of *P. bermudensis* Bedd. forma *ephippiger* Rosa.
6. Distal end of notched seta from same.
7. Spermatheca of *P. albanyensis* Mchlsn.
8. Spermiducal gland of same.
9. Spermiducal gland of *P. albanyensis* Mchlsn. var. **cygni** var. nov.

PLATE XV.

Fig. 1. Spermatheca of **Megascolex syndetoporus** sp. nov.
2. Spermatheca of **Megascolex albidus** sp. nov.
3. Spermatheca of **Notoscolex leios** sp. nov.
4. Spermatheca of **Plutellus varicystis** sp. nov.
5. Distal tip of penial seta of **Notoscolex leios** sp. nov.
6. Spermatheca of **Kerria nichollsi** sp. nov.
7. Distal tip of penial seta of **Woodwardia magna** sp. nov.
8. Distal tip of genital seta of **Eiseniella intermedius** sp. nov.
9. Distal tip of penial seta of **Plutellus candidus** sp. nov.
10. Spermatheca of **Woodwardia magna** sp. nov.
11. Spermatheca of **Eiseniella intermedius** sp. nov.
12. Portion of base of penial seta of **Plutellus candidus** sp. nov.
13. Spermatheca of **Plutellus candidus** sp. nov.

PLATE XVI.

Fig. 1. Longitudinal section through segments 12 and 13 of *Astacopsidrilus novus* f.s., funnel-structure ; g.p., granular ellipsoid particles ; int., gut ; ov., ovary ; pe., penis ; sp.d., spermiducal gland.
2. Section through the apex of the funnel-structure of same (high power), showing gland cells and setae.
3. Penis of same with the sheath incompletely everted.
4. Transverse section of the dorsal vessel of *Einseniella intermedius* in the region of the hearts.
5. Longitudinal section through the clitellum of *Kerria nichollsi* ; c.m., circular muscle ; l.m., longitudinal muscle ; gl.c., glandular layer.
6. Longitudinal section through the gut of *Eiseniella intermedius* in segments 15–19 ; giz., gizzard ; sep., septa.
7. Transverse section through segment 10 of same. d.v., dorsal vessel ; g.s., sacs of the genital setae ; gl.c., gland cells ; ht., heart ; int., gut ; n.c., nerve cord ; sep., septum.
8. Longitudinal section through segments 9–13 of *Kerria nichollsi*. c.f., ciliated funnel ; ht., heart ; int., gut ; neph., nephridial tubes ; oe.p., oesophageal pouch ; o.f., oviducal funnel ; ov., ovary ; sp.s., sperm sacs ; te., testes.
9. Longitudinal section through body-wall of segments 17–19 of same. sp.d., spermiducal gland.
10. Section through the penial bulb of *Enchytraeus albidus*. m.s., muscle strand ; p.b., penial bulb ; v.d., vas deferens.
11. View of the ventral surface of *Kerria nichollsi* (one side only, under high power) in segments 17–19. c.c., clitellar cells ; g., groove ; g.p., glandular papilla ; m.v.l., Mid-ventral line ; sp.p., pore of the spermiducal gland.

Plate XIV.

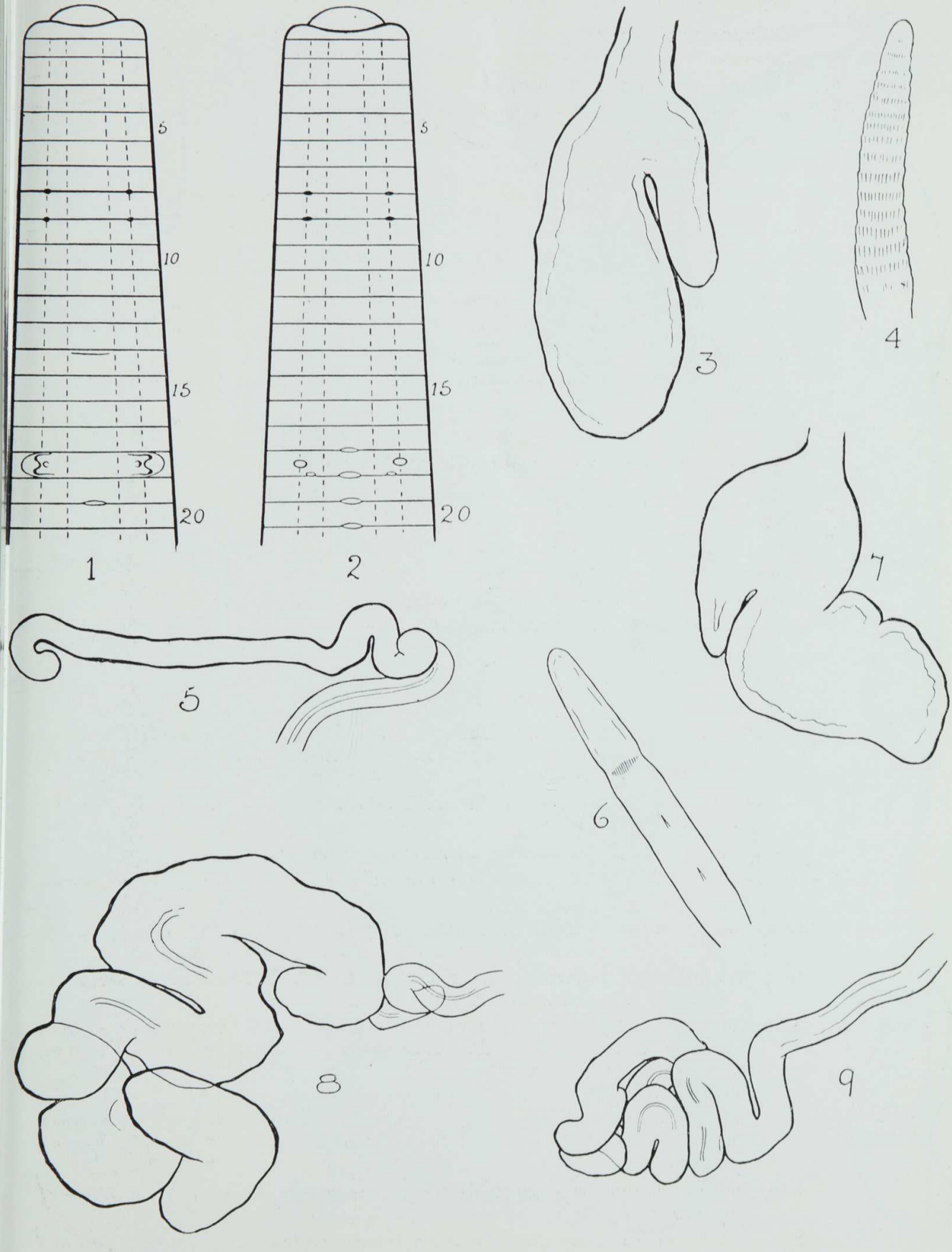


Plate XV.

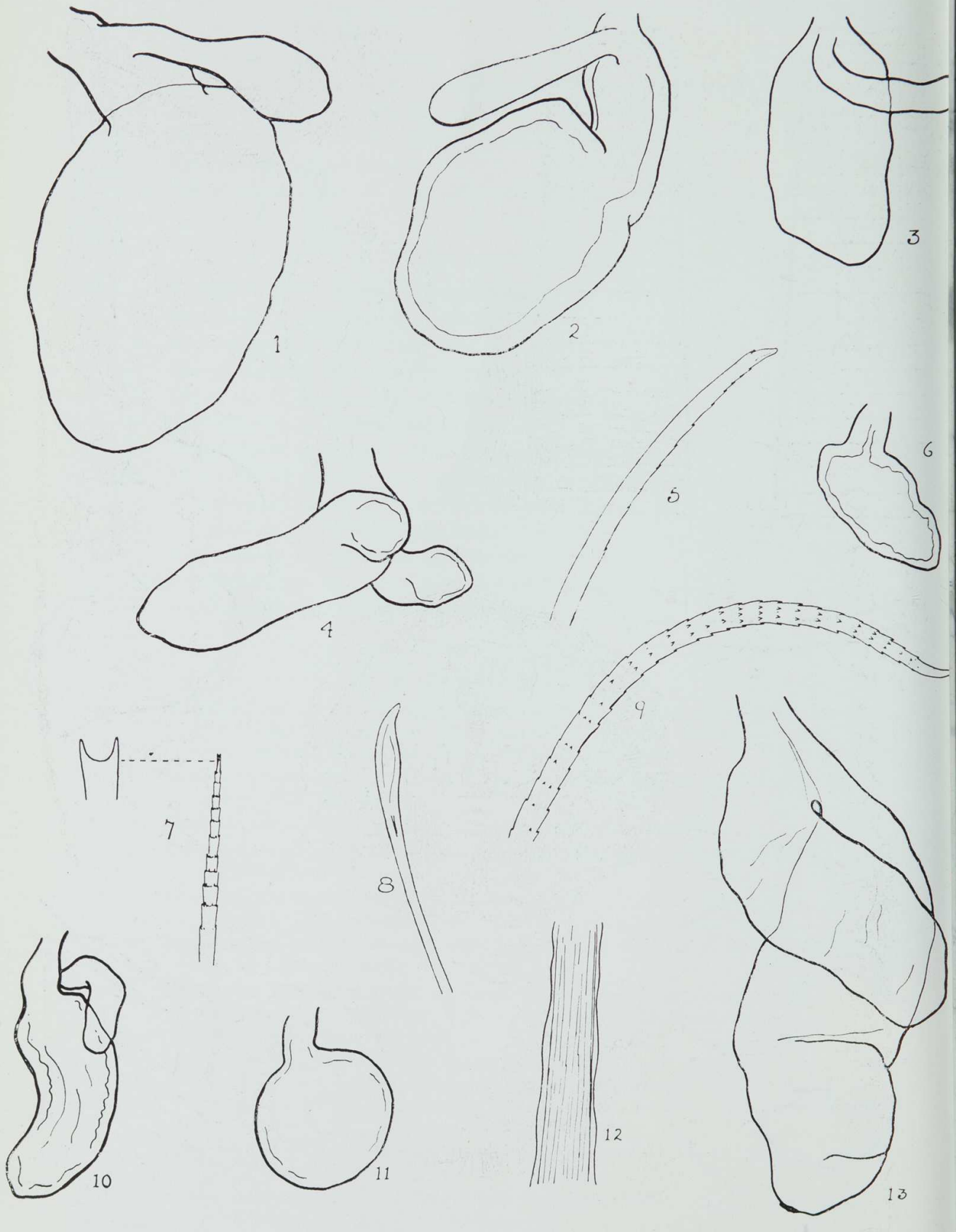
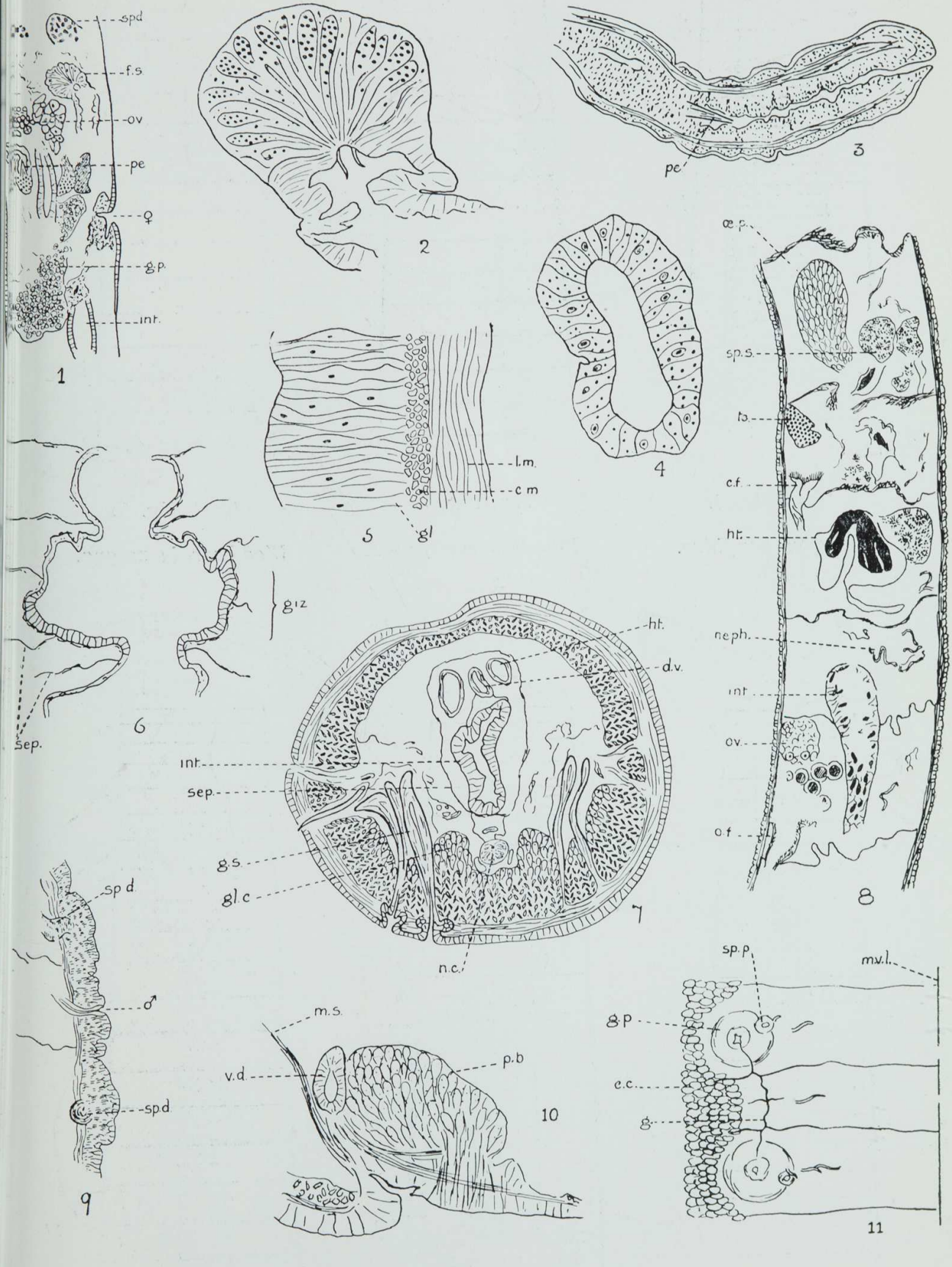


Plate XVI.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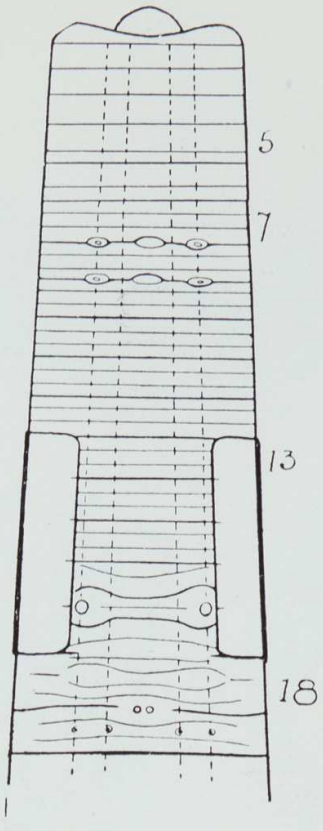
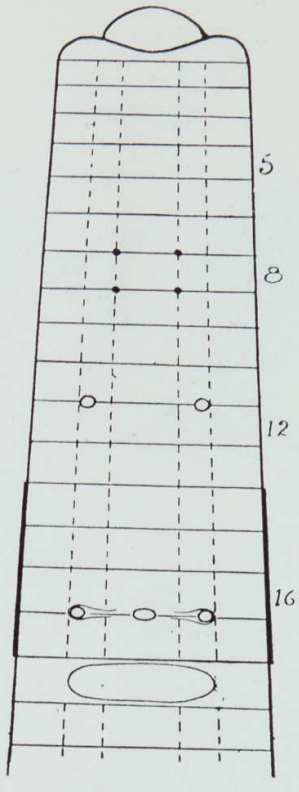


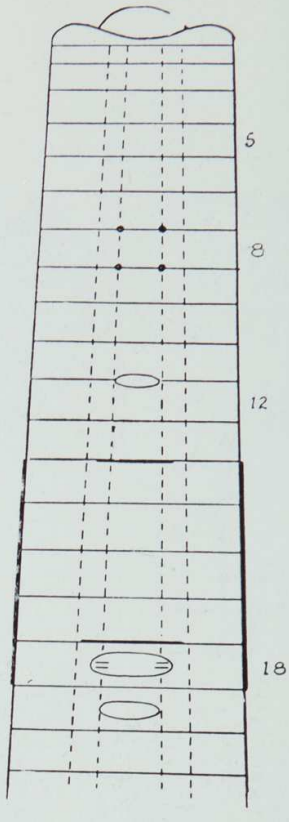
Text-Fig. 6.

Plutellus candidus.



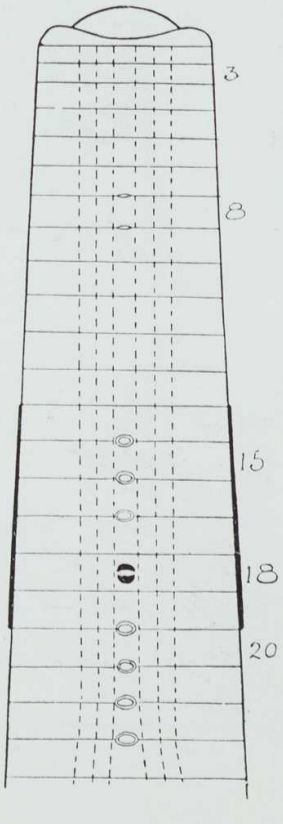
Text-Fig. 7.

Plutellus varicystis.



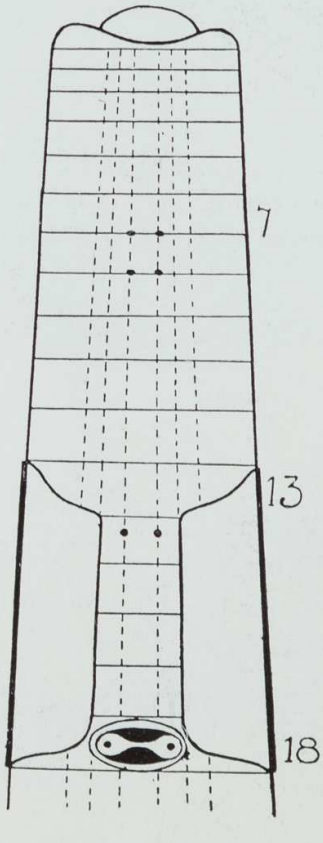
Text-Fig. 9.

Woodwardia magna.



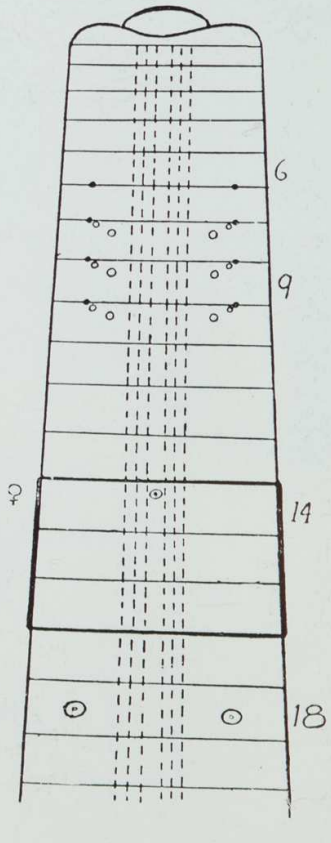
Text-Fig. 10.

Megascolex syndetoporus.



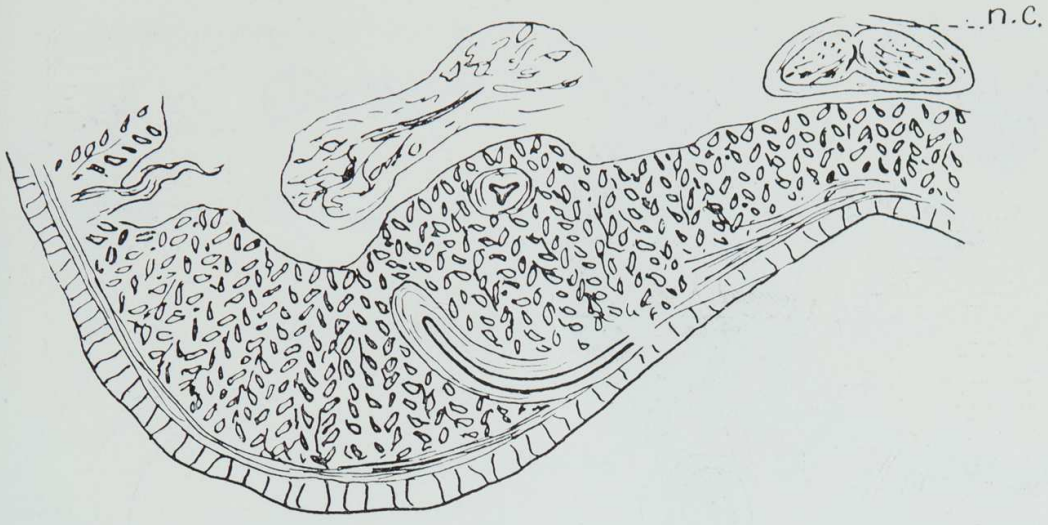
Text-Fig. 12.

Megascolex albidus.

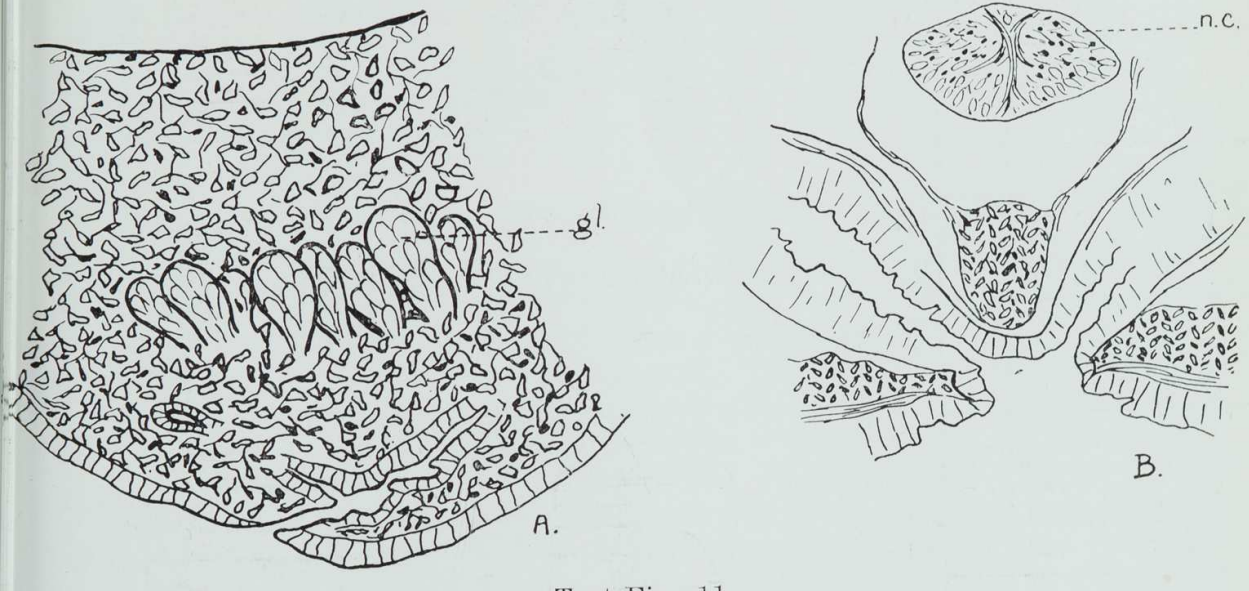


Text-Fig. 13.

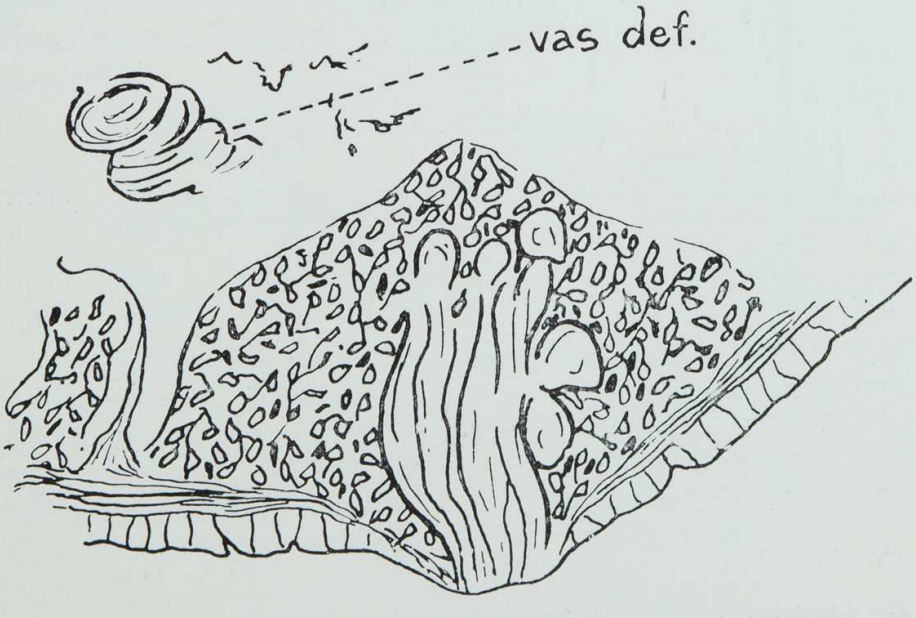
Pheretima heterochaeta.



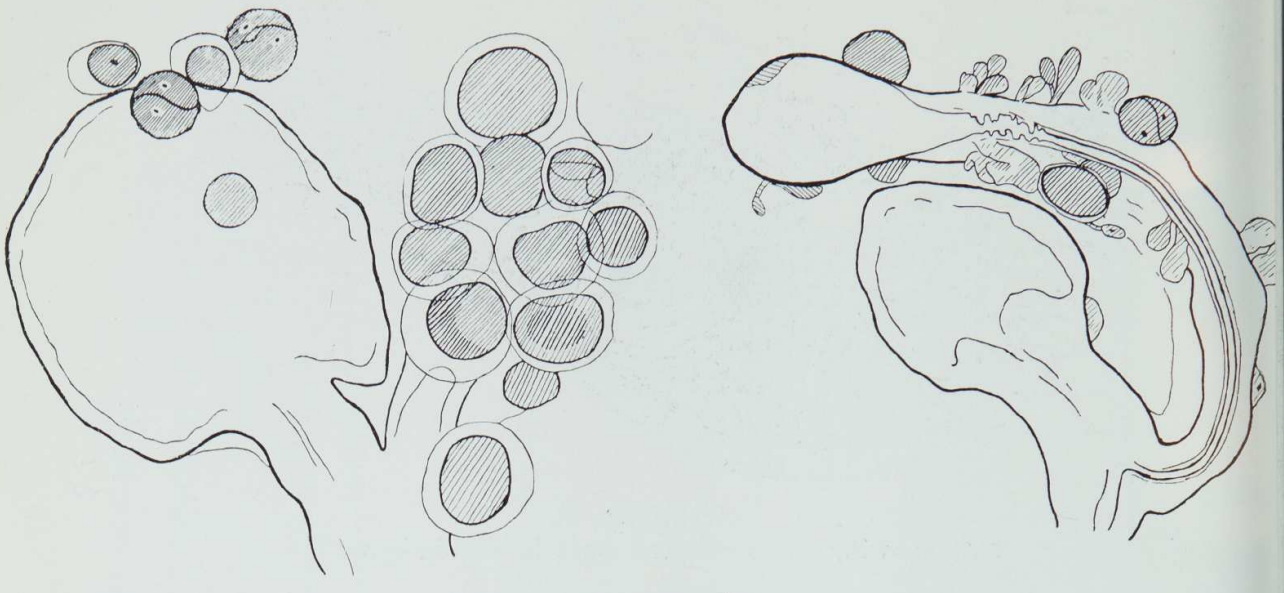
Text-Fig. 8.
T.S. showing male efferent duct in the body-wall.



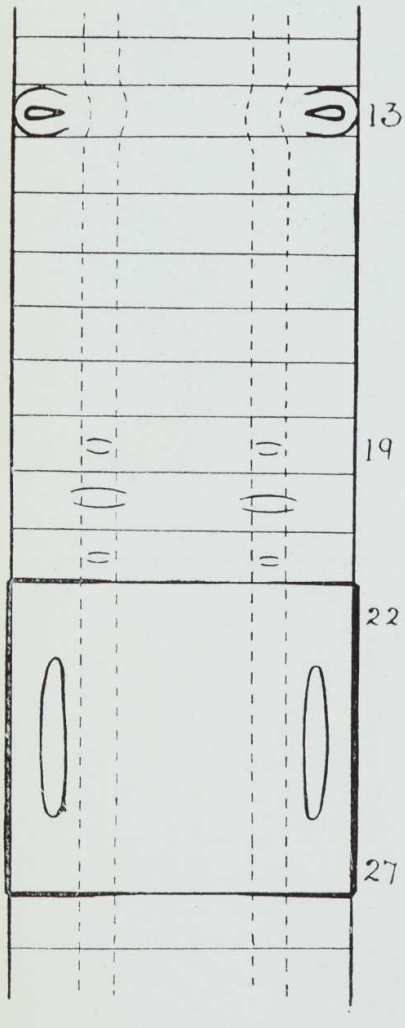
Text-Fig. 11.
Megascolex syndetoporus.
T.S. male pore. gl., glandular fascicles. B. T.S. spermathecal pores. n.c., nerve cord.



Text-Fig. 14.
Pheretima heterochaeta.
T.S. glandular papilla in segment 18.

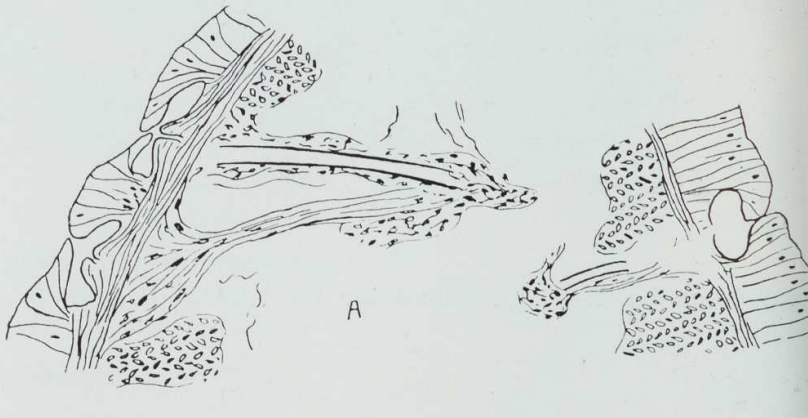


Text-Fig. 15.



Text-Fig. 16.

Eiseniella intermedius.



Text-Fig. 17.

Eisenia foetida.

A. Lateral setal sac from seg. 11. B. Ventral setal sac f
clitellar region.

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